THE CHEMICAL AGE

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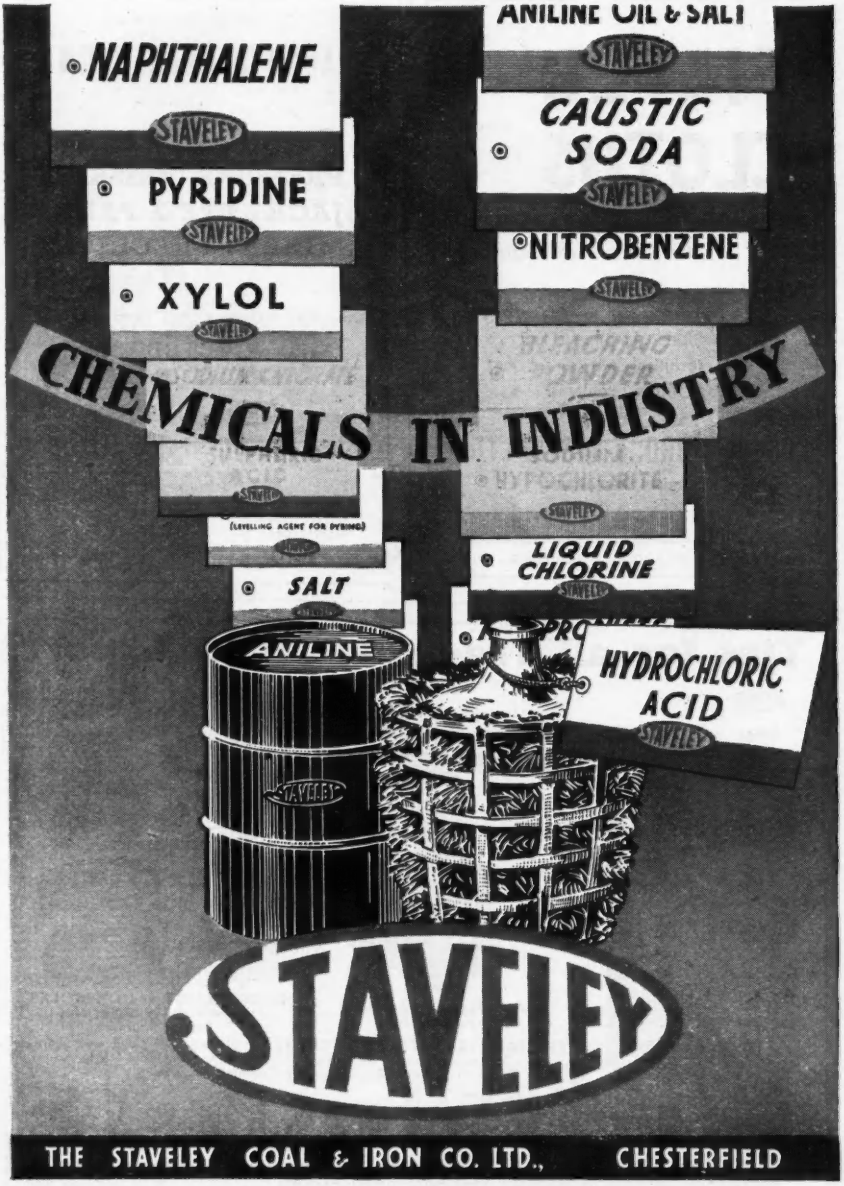
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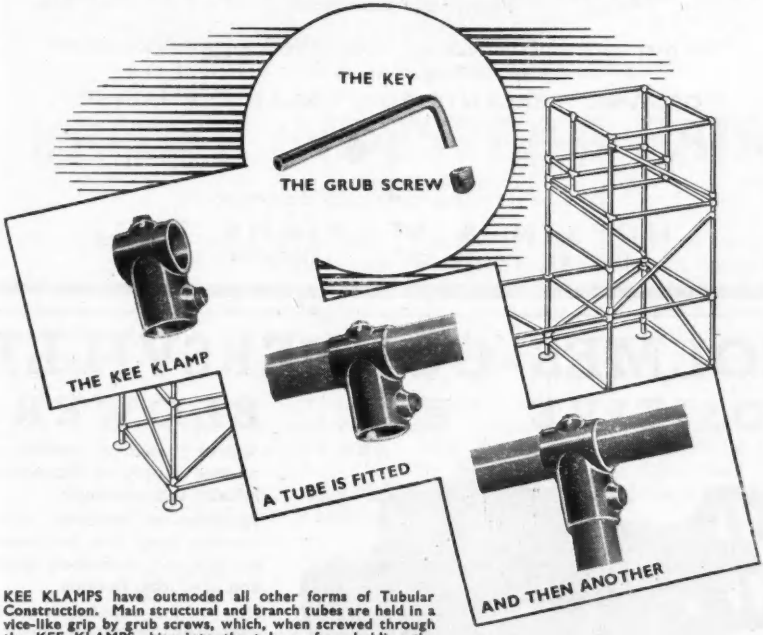

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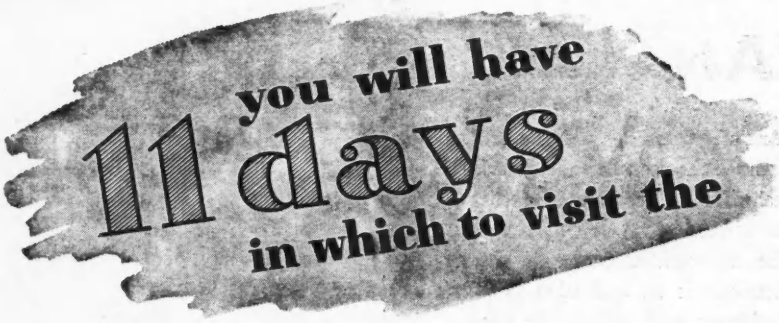

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The Patient Prescribes

AN old jibe, often repeated, calls upon the physician who would cure others first to heal himself. British industry is sick, of that no one who has read "The Economic Survey for 1947" can have any doubt. That document was the diagnosis. It was not a prescription. It does not seem that the doctor, if such we may class the Government, has any prescription to offer. Consequently the patient, in the persons of the T.U.C. and the Federation of British Industries, has attempted to produce one.

The general prescription is not markedly different from that suggested by us when discussing the White Paper. Both the T.U.C. and the F.B.I. advocate a higher coal target, ask for a re-examination of policy on export of machinery, call for a speeding up of power station construction, express grave anxiety about rail transport, urge the importance of increased rail productivity and desire continuous close consultation with individual industries and industry as a whole. There is a striking measure of unanimity in the pronouncements of these two bodies which augurs well for the consultation which they are to have with the Government.

The problem that is facing us to-day is one which demands the united wisdom of everyone who has any contribution to make to the subject. There would be no point in endeavouring to point out the reasons for our present plight if it were not that a diagnosis may serve to prevent further deterioration of the situation. Having critically watched the conduct of affairs during the past two years the conclusion to which we have come, and which is supported by the F.B.I. and many other equally keen observers, is that it has largely arisen from mismanagement of the nation's business. For this the Government must accept the major share of responsibility. The Labour Government is young in experience of governing. Fired by the theoretical ideal of "Socialism in Our Time" they have rushed into one scheme after another of nationalisation, each Minister apparently competing with other Ministers to get his particular scheme put forward at the first possible date. The President of the Board of Trade has staked everything on export utterly regardless of the need for building up a powerful mechanised industry that can produce first-quality goods at low cost. Other Ministers have uprooted the coal industry and air transport, and are proceeding to uproot electricity, gas, land transport and even iron and steel. At a time when careful and

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experienced planning for future output was necessary, at a time when the American loan would have permitted this to be done, we have squandered our opportunity. The Government has tried to do too much with too few resources.

Planning is necessary. No well-run business can afford to operate without making plans for the future. It is equally necessary of course to put the plans into action and failure to put the right plans into action at the right time has been one of the greatest reasons for the deterioration of the situation which has taken place over the last 18 months. The shortage of fuel that we are now experiencing is only one symptom of this. There is a lack of everything that we need to enable us to live, not in luxury, but under reasonable conditions of a civilised country. The fact that two years after the end of war we still do not seem to be getting anything into our shops that is so badly needed is surely full confirmation of the mismanagement to which we refer. It happens that coal has been the first thing to become so short as to cause a breakdown, though insufficiency of electric power—due not to coal shortage but to equipment shortage— occurred even before the coal breakdown.

We shall not attempt any final analysis of what must be done to put matters into order. The appointment of Sir Edwin Plowden as Chief Planning Officer should be a step in the right direction. It is quite evident that three things are needed. (1) Greatly increased production per man-shift and per man-year. (2) A complete re-requipment of many of our industries in order to permit mechanisation to play its part in increased production. (3) A reduction of the inflationary pressure caused by too much money running after too few goods.

The present coal targets are far too low. The only method which the Government appears to have of handling the coal situation is to increase wages and reduce the working period of the miners in the hope that they will be thereby induced to work harder; the whole history of the mining industry over the last 30 years is against the prospect that that solution will achieve its object. Why are we exporting coal-cutting and other mining machinery at a time when our mines are under-mechanised? Why are we permitting the installation of electrical appliances in homes, a use of electricity which is demonstrably inefficient, when we have not enough power for industry Why are we exporting power station equipment when we have not enough electricity to keep our own industry going because we have too few power stations? The supply of raw materials to the steel industry and for many other industries is insufficient and unremitting efforts should be made to increase the supply of critical materials. Both the F.B.I. and the T.U.C. foresee the probability that the next serious breakdown may well be in transport if we do not put our railways into repair. While we are about it, why do we not save 10 million tons of coal a year by turning our railways over to electricity and diesel engines?

There are many questions of that type which can be asked and which no doubt will be asked when the T.U.C. and the F.B.I. meet the Government. It is evident that although the Government came into power as a Government of planners, they have proved that they are incapable of sound planning. We very much doubt whether the main mass of the working classes is yet fully aware of the condition of the country or of the need for putting forward every effort. The Government in collaboration with the T.U.C. could do much to convince the ordinary man and woman of what is needed. Basically, a great deal of what is needed for the rehabilitation of this country could be achieved if everyone could be persuaded to make a little greater effort. It may be too much to expect us as a nation to recover the spirit which sustained us during the war. We are tired, and many of our younger people are away in the Forces. Much could be done in our opinion by bringing back the incentive to work and to save.

This is a time for heroic measures which may well be highly unpalatable. The situation although desperate is far from hopeless. The F.B.I. has concluded that " resolute action now, coupled with an all-out effort on the part of every individual in this country to pull his full weight, whatever his job, can and will make our future secure." Is it too much to hope that for the future the making of plans for industry will be entrusted only to those who have experience of the management of industry?

NOTES AND COMMENTS

Wanted—A Slump

"WHAT we want is a darn good slump." That is not our view but one by which Mr. L. E. Lines, chairman and managing director of the Universal Steel Tube Co., startled the first regional conference on industry and research organised last week at Birmingham by the Federation of British Industries. In most of his audience Mr. Lines's outspoken attempt to uproot complacency may have invoked the retort that the slump may not have to be sought if a more realistic attitude is not quickly adopted by the administration towards the things which tend to make British goods costly or hard to get in the world markets and the present hardening of trading conditions continues. The iconoclast at Birmingham, however, said he would like to see happening some other things which suggest that his motives may not have been altogether unlike those of the Fat Boy of Dickens. "We should be a better country," he declared, "if all the professors of our universities had spent 12 or 18 months digging coal or ploughing the land when they were young. That would give them more of the common touch and they would reap the benefit later." Physically, no doubt, a spell in youth with the pick or plough might have conferred benefits which some of our more academic types conspicuously lacked. But if it is claimed, for example, that our research chemists have their heads lost in the clouds their immensely practical performance in war, the results of which are still widening the scope and efficiency of many peace industries, is a complete answer. The liaison between the laboratory and the workshop is admittedly still not as close as it should be and the responsibility for that lies squarely on industry itself, which is well able to endow research, as some have handsomely done. And the paymaster still calls the tune.

Swiss Chemicals

AS a healthy alternative to too prolonged a study of one's troubles, there is much to be said for briefly contemplating those which beset the other fellow. The *Bulletin* of the Swiss Credit Institute, a review of 1946, seems to provide for the British chemical industry a particularly opportune survey of the way in which post-war difficulties are hampering its counterpart in the middle of the Continent and cannot fail to provide some valuable indications of ways in which the British industry can benefit. Swiss chemical manufacturers are ruefully discovering, as we have done, that the havoc war produces does not cease with the end of hostilities. At the end of the first full year of peace, the benefits accruing from the lifting of economic warfare have, says the Institute, been negatived to a large extent by restrictive controls, shortages of raw materials and international currency problems. The supply of insecticides, from which Switzerland, the pioneer of DDT, expected to benefit very substantially has not shown the results anticipated. The shortage and rising world prices of raw materials, much of which has been diverted to domestic needs, and —a more serious factor—the rapid development even in countries not highly industrialised of home industries producing cheaper and inferior substitutes of the Swiss commodities are among the adverse factors mentioned by the *Bulletin*. Dyestuffs and pharmaceutical chemicals are among those which have shown increasingly good results. In most other departments of the Swiss chemical industry, however, the continued shortage of some basic materials, notably coal and coal-tar derivatives, is evidently the most serious prob-

Harold: ***You can easily tell if it's deadly by inhaling it for some time.***

lem, because enhanced effort cannot in most cases in Switzerland offer any solution. So far as the coal and derivatives group is concerned, Britain has the advantage, in theory at least. It appears, however, that the chief impediment to Switzerland's more effective competition in the world chemical markets is the failure of the Anglo-Swiss payments agreement of March last year to provide the aid expected, because of the restrictive export regulations which Swiss economic authorities have had to enforce.

Producer and Consumer

THE sentiments of that Member of Parliament who the other day, castigating those uncompromising advocates of "equality of sacrifice" in this time of national crisis, foresaw that such a policy could lead only to an ever-increasing supply of sacrifices to be so shared, are echoed by Sir Ernest Benn, writing this week under the heading of "Profit as a service to the community." Sir Ernest—who in bureaucratic circles must surely be blacklisted as Arch-Enemy No. 1—defends as only he can defend it the now unfashionable "profit motive" and discusses the respective functions of producer and consumer in the economic scheme of things. Arguing that those afflictions of our day—rations and controlled prices—leave no scope for profit to operate in its natural way as an economiser and that they should be regarded as unpleasant necessities while free markets with profits be made the goal at which to aim, Sir Ernest sums up thus: "The pathetic failure of appeals to increase production is simply due to the absence of the natural forces on which all production depends. The profit and loss system maintains a constant pressure on producers to produce. It makes the producer the slave of the consumer. Our present rulers are striving to establish a system under which we shall all work when and as it suits us, as we shall ourselves direct in a self-governing democracy, and yet at the same time enjoy a full consumer life, having each of us prescriptive rights to a full share of the general wealth. If that proposition were practical it would offer a life with no attractions to "man who is man." We cannot have it both ways, and it is good to be clear and definite and discard fallacious thoughts of a life that is unobtainable and even if obtainable would not be worth living. The hard truth is that, as producers, we must be slaves to our consumer selves, or, as consumers, we must be slaves to our producer selves. There must be slavery, obligation, necessity—call it what you will—in any honourable and workable scheme of life. We must stand in the market-place to be hired as producers, or must line up in the queue to be rationed as consumers. In the first arrangement there will always be more and more (not of course all that every body wants) for general consumption, while in the second scheme there will be a steadily decreasing supply of everything, until in the end there is nothing to share but equality of poverty."

French Fuel Oil : Big Home Industry Planned

OUTSTANDING in the proposals of the Conseil du Plan (Monnet Plan) in its bearing on the French fuel oil industry is the contemplated expenditure of 6000 mil. fr. per annum for 15 years on prospecting and research work. This would be undertaken in France and in the territories of the French Union—by which are presumably meant the overseas colonies—and the cost would be guaranteed to the extent of one-third by the State, while the balance would be a matter of agreement with special French, colonial, and foreign companies.

It is anticipated that the consumption of petroleum products will increase from 6.6 mil. tons in 1938 to about 15 mil. in 1955, largely through developments in aviation, mechanised farming, oil-firing, and road surfacing. French tankers will be built to convey at least half of the crude or refined oil imported. A large refining industry is contemplated. By 1955 it is hoped that the home refining industry will save some $100 mil. in foreign exchange and France will be converted into a producing, rather than predominantly a consuming country. It is intended that a part of this industry should be open to foreign interests in order to secure the best possible technical assistance and co-operation in crude petroleum supplies.

The Commission has studied various aspects of the consuming side, including heavy oils, automobile spirit (75 and 85 octane) and agricultural fuels. Little consideration seems to have been given to lignite, of which France has vast resources and about which several articles have recently appeared in the technical Press, including hydrogenated fuel oils from lignite; nor is wood alcohol mentioned, nor the use of vegetable oils, *e.g.*, in the French colonies. To depend almost entirely on petroleum in view of the present unbalanced supply and demand is not a far-sighted policy.

Marine Chemicals in India*

How the Industry was Established and Developed

(*Continued*)

THE brine used by Tata Chemicals is prepared from salt manufactured at Mithapur by the salt department of the company. Before the brine enters the electrolytic cells, it is purified by the removal of small amounts of calcium, magnesium and other impurities present in it as otherwise the insoluble hydroxides would precipitate in the pores of the asbestos diaphragm and greatly shorten its life. The salt is shovelled from the box-cars into the underground dissolver through a screw conveyor. The saturated brine passes on to the treating tank where sodium carbonate and lime are added. The treated brine passes through a series of settling tanks and ultimately to the storage tank through a filter. The filtered salt solution contains about 25 per cent sodium chloride. Sulphate, if present in a large amount, has also to be removed by treatment with barium chloride.

Production of Caustic Soda

The hot purified brine enters the electrolytic cells wherein about half the salt is transformed into caustic soda. The battery of cells at Tata Chemicals consists of diaphragm type cells with a total capacity of 7½ tons of caustic soda per day. The cathode is of sheet steel and the anode which is separated from the cathode by a diaphragm is of graphite. Direct current is supplied to the cells by a motor generator driven by a high voltage synchronous motor.

The decomposition efficiency of cells varies between 40 and 45 per cent and the decomposition voltage between 3.5 and 5 (theoretical decomposition voltage for NaCl is 2.25). The cathode current efficiency varies from 94 to 96 per cent under even running. The energy efficiency is about 61-62 per cent.

The chlorine gas leaves the anode compartment warm and moist. To effect liquefaction it is first dried in stoneware towers down which concentrated sulphuric acid is percolated and the dried gas is subjected to high pressure by compressors. The precooled compressed gas passes into chlorine liquefying coils where it is strongly cooled. Under the combined influence of cold and pressure the chlorine gas liquefies and is delivered into large storage tanks, whence it is filled into steel cylinders or tanks.

A part of the chlorine is used as such to make bleaching powder by interaction on hydrated lime. The plant at Mithapur consists of four concrete towers of circular section, each tower having ten floors swept by rotating rakes which propel the lime alternately outwards and inwards. Chlorine is admitted at the level of the second floor and passes upwards through the towers and meets the descending lime on the counter-current principle. Temperatures at every stage are under control and local over-heating is avoided by constant stirring and refrigeration on each floor, and by transference of the powder from floor to floor.

A part of the chlorine is led to the hydrochloric acid plant where it is burned with excess of hydrogen, also obtained from the electrolysis, in silicaware towers. The Mithapur plant possesses two sets of burners and accessory equipments. The resulting acid passes successively through a cooling battery of silica pipes into a system of precondensation tourills cooled by water and thence into an absorption battery where it is absorbed in distilled water. The product is water white hydrochloric acid of the highest quality.

Zinc chloride is made from zinc flux skimmings, dross or scrap. After being crushed to a paste the material is treated with hydrochloric acid. The resultant solution gets heated to 50°-60°C. and iron impurities are oxidised and precipitated. After separation of solid impurities the liquor is evaporated and the residual zinc chloride filled into drums or cast into sticks.

Caustic Soda from Liquors

There is an elaborate system of plant devoted solely to the purpose of manufacturing solid caustic soda from caustic liquors. The solution from the diaphragm cells contains about 10 per cent alkali and 15 per cent sodium chloride. It is concentrated in the first instance in a series of multiple effect evaporators. The boiling pans have salt separators in which the salt is collected as fast as it separates from the liquor. The suspension from the pan and separator is pumped to a settler with monel wire gauze over a conical base. The salt settles on the wire gauze and the caustic liquor collects in the cone. The liquor passes to cooling tanks where any salt in suspension is carefully removed by settling. The 50 per cent liquor next reaches the cast iron pots heated by producer gas fire where all the water is evaporated. The liquid anhydrous caustic is removed from the pots and directly filled into thin steel drums on low trucks.

Three upright shaft kilns with a total capacity of 60 tons of chemical lime are provided. Their sole purpose is to prepare

* From the *Journal of Scientific and Industrial Research*, India.

lime of specially high quality for the bleaching powder plant. The limestone is obtained mostly from the local quarries operated by the company. The decomposition of limestone takes place at a temperature above 900°C. The kilns run both on natural draught generated in the shaft as well as on forced draught induced by blower fans.

The prepared lime is carefully hand-picked, dressed and analysed and then hydrated in a mechanical rotary hydrator. After this operation it is screened and stored in silos. The final product has a uniform moisture content and is suitable for best quality bleaching powder manufacture.

The manufacture of soda ash is carried out at Mithapur by the well-known ammonia soda process. The process as described in the text books appears to be simple, but in actual practice has many complications, as large volumes of gases and liquids are handled in giant containers. The Mithapur plant is capable of turning out 150 tons of soda ash per day.

Salt, the chief raw material, is supplied by the salt department. A saturated solution of the crude salt containing about 300 gm./litre is purified by the lime soda process to remove the calcium and magnesium impurities present in it. The purified brine is pumped to a head tank from where it flows to the absorber towers.

Later Stages

The second stage is the decomposition of limestone by burning in the kilns. The kiln is made up of steel shells and lined with firebricks. The height is about 80 ft. and diameter 15 ft. Limestone and coke are fed into the top of the kiln and the lime is mechanically discharged at the bottom. The resulting kiln gas containing about 40 per cent CO_2 is scrubbed and compressed to about 3 atmospheres.

The third stage is the saturation of brine with ammonia gas recovered from a previous cycle. The resulting ammoniated brine contains about 80 gm./litre ammonia and 260 gm./litre sodium chloride. Necessary amount of sodium sulphide solution is added to prevent corrosion of cast iron vessels and pipe lines.

The fourth stage is the manufacture of crude sodium bicarbonate and its calcination. Here the ammoniated brine is treated in a carbonating tower with compressed carbon dioxide from the kilns and rotary calciners. The ammonia gas and carbon dioxide combine together to form ammonium bicarbonate which reacts with sodium chloride to produce ammonium chloride and crude sodium bicarbonate. The resulting magma of sodium bicarbonate is filtered through rotary drum filters. The washed sodium bicarbonate drops into a belt conveyor which feeds the calciners in which the bicarbonate is decomposed by calcination into soda ash, carbon dioxide and water.

In order to avoid lump formation in the calciners, some dry soda ash is also fed. The finished ash is stored in large concrete silos. After cooling, the ash is packed in gunny bags and stored in a dry place.

Recovery of Ammonia

The last stage is the recovery of ammonia from the mother liquor containing free and fixed ammonia. The liquor is pumped into the top of the ammonia stills, where the free ammonia is volatilised in the free still. About half-way down in the fixed still, milk of lime is introduced to decompose the fixed ammonia compounds. The milk of lime for the ammonia still operations is supplied by the central milk of lime plant. To make up the ammonia losses in the cycle, ammonium sulphate is dissolved and added to the mother liquor from time to time as required by the process.

In addition to the electrolytic caustic soda there is a plant to causticise 20 tons of soda ash per day in large tanks. The milk of lime for the operation is supplied by the central milk of lime plant. After causticising, the material is pumped to a settler to separate the calcium carbonate mud. The resulting lye is evaporated in multiple effect vacuum evaporators to 50 per cent solution and fused to solid caustic in caustic pots. The finished product of this process is of higher purity than the caustic obtained from the electrolytic process.

Causticising Equipment

The equipment consists of thickeners, agitators, rotary filters, diaphragm pumps, lime slakers and classifier, etc.

As mentioned above, the purified milk of lime containing about 250 gm./litre of available calcium oxide is supplied to this plant by the central milk of lime plant. Soda ash solution of about 18 per cent sodium carbonate content is made by using the return wash liquor from the cycle in dissolvers with stirrers in the process house near the soda ash storage, and pumped to the plant. The solution is first causticised with excess of milk of lime in the three causticising agitators in series. From the last unit the suspension is passed to a big continuous multiple tray thickener for efficient separation of the solids from the liquid phase and the sludge is thoroughly washed by the counter-current arrangement. The sludge from the bottom of the first thickener is pumped out by a diaphragm pump to a rotary filter, and the cake containing a little excess lime is washed with a dilute soda solution. The liquor is returned to the first thickener. Fresh water is also used to wash the cake and the water returned to the thickener. In this way the washing cycle

goes on and the alkali recovery is as high as 99.5 per cent.

A plant to manufacture about 10 tons of refined bicarbonate of soda per day has been set up. A saturated solution of soda ash is pumped to a large storage tank in the plant and then to the bicarbonate tower, where kiln gas is introduced by the compressors just as in the Solvay process. The draw temperature in the towers is kept a little higher than in the Solvay process (about 39°-40°C.). The magma is filtered, washed and centrifuged. The centrifuged crystals are dried in a dryer. The temperature of the hot air in the dryer is maintained between 70°-90°C. The finished product obtained by this process has a very high degree of purity, containing about 99.9 per cent sodium bicarbonate.

The area occupied by the structural units, plant houses and equipments alone is about 60 acres, while the total area acquired by the company is over 4000 acres. Besides the houses briefly refered to above, the works has a well designed and commodious central analytical and research laboratory with accommodation for pilot plants and is provided with a large technical and reference library. There are also an analytical control laboratory for the ammonium soda process and various stage laboratories. A large foundry, a well equipped workshop and a modern power supply station are attached to the works. The water-supply for the works and the town is obtained from two large catchment areas, situated at a distance of about nine miles from the works and zero water is supplied to the high pressure boilers by the water softening plant.

There is a monthly paid staff of about 500 employees including about 100 chemists and 50 engineers, and about 2500 workers on daily wages are employed at Mithapur. All the members of the staff and most of the workers live in the company's town which is provided with all the modern amenities. Mithapur which was once an arid place has now been transformed into a thriving and modern industrial town.

Purifying Acetonitrile

Continuous Process Described at Manchester

"THE Continuous Purification and Azeotropic Distillation of Acetonitrile" was the subject of a paper by Mr. H. R. C. Pratt, B.Sc., F.R.I.C., presented at the last meeting in Manchester of the North-Western Branch of the Institution of Chemical Engineers. The chairman of the branch, Mr. T. Penny, presided. Acetonitrile, said Mr. Pratt, was obtained in a pilot plant by the dehydration of a mixture of acetic acid and ammonia, silica gel at 500°C. acting as a catalyst. The products, acetonitrile and water, were passed into a stripping column and were treated with a 25 per cent solution of sulphuric acid, introduced into the column just above the product feed point, and live steam entering the boiler at the base of the column. The overhead vapour, consisting of an azeotrope containing 83.5 per cent acetonitrile, was condensed, part of the condensate being returned as reflux to the top of the column and part sent into the dehydrating column for treatment with trichlorethylene as entrainer.

Stages in the Process

The ternary azeotrope, trichlorethylene-acetonitrile-water, obtained from the top of the dehydrating column, was condensed, one portion of it being returned as reflux to the top of the column and the other separated in a decanter into two layers, the aqueous nitrile and the entrainer. The latter layer was also returned to the top of the column and the former was first distilled to remove acetone, which occurs as a by-product, and was then returned to the stripping column. Purified acetonitrile containing only a little water was obtained from the bottom of the dehydrating column.

For design purposes it was necessary to obtain vapour-liquid equilibria for the binary systems, acetonitrile-water and acetonitrile-entrainer, also the liquid-liquid and the vapour-liquid equilibria for the ternary system, entrainer-acetonitrile-water, trichlorethylene being taken as the best entrainer. Specific gravity and miscibility diagrams were prepared for the various mixtures and liquid-liquid equilibria were obtained at the boiling point for the ternary mixture.

While the design of the stripping column was relatively easily done, the dehydrating column had to be designed from plate-to-plate calculations. Gilliland's method for the location of the feed to the dehydrating column indicates a point too high for an azeotrope distillation column. Examples of the calculations of the minimum reflux ratio and of the detailed design of a dehydrating column were given and other aspects of the work were well illustrated by graphs and diagrams. A valuable discussion followed.

U.S. Sulphur.—U.S. crude sulphur output reached the highest level last year with 3,859,642 long tons.

Association of Tar Distillers

Active Year Reported : New Officers

A YEAR of varied and useful activity is recorded by the Association of Tar Distillers in its annual report for 1946, from which we abstract the following items of speal interest.

British Tar Confederation.—The Association continued its active co-operation in the work of the Confederation during the year. The Memorandum and Articles of Association of the proposed Coal Tar Research Association were approved by the Department of Scientific and Industrial Research.

Tar Fuel Oils.—National needs for Coal Tar Fuel 200 (creosote/pitch mixture) were supplied through the Petroleum Board, and small amounts of C.T.F. 50 and C.T.F. 100 were also supplied during the year.

Road Tar.—Considerably increased home demands for road tar have been met and exports to Continental countries have been made under arrangements of the Export Sub-Committee of the National Road Tar Committee.

Pitch.—The large and increasing demands for pitch for home briquetting requirements have been met; large amounts of pitch have also been used for fuel purposes, including burning by members on their own works, and considerable exports have been arranged and shipped. Considerable experimental work was undertaken on pitch mastic for flooring under the auspices of the Coal Tar Bituminous Products Sub-committee during the year, and is continuing.

Creosote.—A Creosote Export Groups Committee was formed during the year to co-ordinate export activities on creosote; although the greater part of the creosote production was absorbed by various home demands, a considerable tonnage of creosote was exported, mainly to the U.S.A.

Phenol.—In view of the shortage of phenol to meet essential requirements, synthetic phenol was temporarily exempted from Key Industry Duty early in the year.

Benzole and Toluole.—The industry has continued to co-operate with the Ministry of Fuel and Power through the Benzole Advisory Committee. Arrangements were made with the Ministry for the disposal of Government-owned surplus toluene.

Naphthalene.—The demand for naphthalene steadily increased during the year. Discussions on the supply/demand position were instituted between the Napthalene Subcommittee and two of the main consuming bodies, *i.e.*, the chemical consumers, represented by the Association of British Chemical Manufacturers, Naphthalene Consumers Committee, and the firelighted manufacturing industry, represented by the National Association of Firelighter Manufacturers; these discussions are continuing.

Carbon Black.—The industry has kept in touch with the Government through the Coal Tar Control, on the question of carbon black manufacture, though the interest in the matter is limited to a very few members. In July representatives of the Association attended a meeting of the Interdepartmental Committee on carbon black set up by the Government, but there have been no further developments.

German Chemical Industry.—The Association has continued to co-operate with the Association of British Chemical Manufacturers and the various Ministries in connection with investigation of German industry, interrogation of German scientists, etc., and members have had opportunities of nominating technicians to teams visiting Germany, of borrowing or purchasing copies of reports on German industry, etc.

Hydrocarbon Oil Regulations.—The Association has kept closely in touch with developments on the Hydrocarbon Oil Regulations; when the Chancellor announced his intention of removing the duty of 1d. a gallon from imported fuel oil and granting a subsidy of 1d. a gallon on home produced fuel oil from October 1, 1946, until the next Budget, the Association co-operated with the Ministry of Fuel and Power in devising arrangements to collect the subsidy.

International Trade Negotiations—Conferences for the Reduction of Trade Barriers.—The Association co-operated with the Association of British Chemical Manufacturers in its examination of overseas tariffs in preparation for the proposed international negotiations on the reduction of trade barriers.

British Standards Institution.—The Association has maintained its close relationship with the British Standards Institution on the work of the Institution's committees dealing with tar and allied products.

The following officers and executive committee were elected at the recent annual meeting of the Association:

President, Mr. W. A. Walmsley (Thomas Ness, Ltd.); *vice-president*, Mr. C. Lord (Lancashire Tar Distillers, Ltd.); *honorary treasurer*, Capt. C. W. Harriss (Burt, Boulton & Haywood, Ltd.); *honorary auditor*, Mr. E. Hardman (E. Hardman Son & Co., Ltd.); *Executive Committee*: President, vice-president, immediate past-president and honorary treasurer, together with: Mr. L. Hilton and Mr. T. A. Wilson (Scotland); Mr. J. Colligon and Mr. W. A. Walmsley, pres. (N.E. Coast); Mr. C. Lord, vice-pres.. and Mr. A. E. Brown (N.W. Coast); Mr.

[*Continued on page* 446]

Oils, Waxes and Resins

Increasing Uses in the Dyeing Industry

GREAT developments have taken place in the past 20 years in the manufacture of stabilised emulsions and dispersions, permitting a variety of interesting effects in dyeing to be obtained which has lead to their wide adoption by the textile industry.

The products of chief interest are essentially emulsions of oils or waxes in water, and aqueous dispersions of synthetic resins. The stability of these products, which is a factor of the greatest importance to the user, is largely due to the new technique devised for their manufacture and to the use of stabiliser of various special types. The latter, which are also referred to as emulsifying or dispersing agents are grouped into five main classes: (1) soaps, (2) sulphated or sulphonated organic compounds, (3) quaternary ammonium compounds or "Cationic Soaps," (4) non-ionic agents, (5) proteins.

The products of classes 1 and 2 are called anionic surface active-agents, because of the way in which they ionise or dissociate when dissolved in water, and they give emulsions and dispersions of the negatively charged type. Quaternary ammonium compounds, on the other hand, are described as cationic surface active agents, and impart a positive charge to the dispersed droplets or particles in emulsions and dispersions.

Physical Characteristics

The newest types of stabilisers belong to the non-ionic class. These are organic substances in which the solubilising group is built up by the successive linking together of ethylene oxide molecules to give what is called a polyethenoxy chain. Although these products have in a high degree the surface active properties associated with the older types of stabilisers, they do not ionise in solution, and therefore cannot impart a charge to emulsion droplets or dispersion particles, although these may be charged as a result of the presence of electrolytes in the aqueous phase.

Proteins possess both basic and acidic properties and according to the degree of acidity or alkalinity of their solutions can be used to give emulsions and dispersions of either the positive or negative type.

Many theories have been put forward to explain the behaviour of emulsion and dispersion systems, which is as yet by no means completely understood. However it is now generally accepted that emulsifying agents are absorbed at the surface of emulsion droplets to form a protective envelope or film, and this is the principal factor governing the stablity and general behaviour of the emulsions. Small droplet size and the presence of an electric charge are other factors which also play an important part. Oil emulsions are widely used in textile processing as lubricants in spinning and for general finishing purposes.

Miscible Oil Solutions

The newer emulsifying agents can be dissolved in oils to make the latter miscible with water, *i.e.*, stable emulsions can be obtained with a minimum of stirring, and these agents are therefore of great utility in emulsion preparation.

In the manufacture of water-repellent finishing agents, *e.g.*, Dipsanil V, which are essentially positively charged wax emulsions, use is made of special machinery to obtain products in which the wax particles are extremely small. This process of size reduction is known as homogenisation and yields products of great stability. Dipsanil V like other finishing agents of the positively charged type has affinity for textile fibres and can be applied by exhaustion as well as by impregnation methods.

Anionic or negatively charged emulsions do not possess affinity for textile fibres, but can be applied by exhaustion methods, using special techniques.

Synthetic resin dispersions are closely similar in physical properties to emulsions and are now being developed for a wide variety of uses, such as the manufacture of laminated fabrics by bonding or combining processes, yarn coating and for general finishing purposes. It is, of course, important to select the correct type of resin for a particular purpose, as resins vary considerably in softness, flexibility and durability.

Of particular interest at present are the exhausting resin dispersions typified by Calatiac MMP. This product was specially developed for the anti-snag finishing of nylon hose, and is applied by a simple exhaustion method. The dispersion is stabilised with a quaternary ammonium compound and the resin are positively charged, it is therefore important when using particles Calatac MMP to prepare the hose with a non-ionic agent to avoid destroying the stability of the dispersion, which is sensitive to agents of the anionic type.

* From a paper by Mr. J. R. F. Jackson (Dyestuffs Division, I.C.I., Ltd.) to the Scottish Section, Society of Dyers and Colourists.

Tanganyika Mineral Exports Drop.—Mineral exports from Tangayika during January fell to £85,000, compared with £147,000 during the same month of 1946.

Czech Taxation of Patents

THE Czechoslovakian Government has issued a decree under which the holders of Czechoslovakian patent rights that represented a material value on November 15, 1945, are liable to submit a tax return. Patents are considered to represent a material value if royalties were paid or were due on November 15, 1945, or if negotiations were terminated in the meantime resulting in the granting of a licence or other consideration.

The tax return has to contain an estimate of the value of such patent rights—for example, the expected yield from manufacture, licences, imports, etc. No return is required for patents that did not represent a material value on November 15, 1945, and no return in respect of trade marks. Failing a return for a patent liable to it may lead to sequestration of the patent. The number of the patent or patent application and its estimated value on November 15, 1945, have to be submitted. If several patent rights are in the hands of one owner, their taxable value is added up. The tax has to be paid within 45 days after the date of the return. For British patentees it may be of interest that money from "blocked accounts" in Czechoslovakia can be used for such tax payments.

This information, together with a scale of taxation, is given in a pamphlet of the Association of Czechoslovakian Patent Attorneys.

New Standard Chemicals Factory

IN accordance with its policy of expansion and development Standard Chemical Co., Ltd., has announced the intention of establishing a chlorine-caustic-soda industry at Sarnia, Ontario. Construction will commence this year and it is expected that the plant can be brought into production during 1948. The annual capacity of the initial installation will be 18,000 tons of liquid chlorine and 20,000 tons of caustic soda. It is estimated that the output from this unit will fully take care of the shortages of supply in both commodities which have been experienced in Canada during the last year, but the design of the plant provides for economic expansion when the demand justifies such a development.

Facilities are being provided in the new plant to produce all the normal grades and package sizes of both chlorine and caustic soda so that the requirements of consumers from the largest to the smallest may be adequately taken care of.

Standard Chemical Co., Ltd., in the development of this project has received the fullest co-operation from the Dominion Government-owned Polymer Corporation plant at Sarnia.

Indian Developments

TWO important developments in the chemical industry have recently taken place in Hyderabad, the largest of the Indian States. The first is the establishment of the Hyderabad Chemical and Pharmaceutical Works, which recently came into production. The factory is composed of the following units: grinding and sifting, powder mixing and tablet making, non-spirituous preparations, spirituous preparations (both hot and cold processes), distillation and an analytical and standardisation laboratory. Three further departments are now being added for injectable, glandular preparations and fine chemicals. The testing and manufacturing departments are equipped with up-to-date machines mostly made to the company's own design in India. The second development is the Hyderabad Chemicals and Fertilisers, Ltd., which went into production at the end of 1944. The commodities manufactured are sulphuric acid, nitric acid and hydrochloric acid, alum and iron sulphate, coal carbonisation and wood distillation products, acetic acid, wood tar, charcoal, etc.

Chemical Engineers

MEMBERSHIP of the Institution of Chemical Engineers increased in 1946 by 146, including 56 associate members, to 1850. This is one of the items of a year's successful activities recorded in the annual report of the Council of the Institution presented at the annual corporate meeting in London on Thursday. Income during 1946 showed a corresponding increase to £6671, of which £3880 was derived from subscriptions by members and associate members, and there was a surplus of £125 at the end of the year. The wider distribution of information is reflected in the increase of £200 in expenditure on printing; and during the year two bursaries were granted, each of £100. Having regard to the fact that members admitted at reduced subscriptions as graduates have not always reached the standard to qualify for associate membership, the Council recommends that, rather than to terminate their membership, such graduates should be required to pay an increased subscription.

Import of Citric Acid

The Ministry of Food expects to be in a position to distribute small quantities of imported citric acid. The Ministry proposes to allocate supplies direct to such importers as can establish their claim to having engaged in this trade in the years immediately preceding the war.

Importers who wish to participate in this scheme should apply for full details to the Ministry of Food, Miscellaneous Food Products Division, 39 Portman Square, W.1.

Nitric Acid Production Plant

War Equipment for Disposal

A NUMBER of acid-producing plants available for disposal to the chemical industry are described in detail in the *Board of Trade Journal*. These are some of the plants developed in war for the production of nitric acid for explosives and which are now being devoted to peacetime uses, notably to increase the supplies of agricultural fertilisers.

Of particular interest are two pressure oxidation plants of Du Pont design each capable of an output of 42 tons of HNO_3 as 60 per cent acid per 24 hours. The plants work at 115 lb. per sq. in. pressure. Ammonia is supplied either in the form of liquor containing 25-35 per cent NH_3, or as anhydrous ammonia (100 per cent). Plant is provided for either process. Equipment provided with each installation includes liquefied ammonia storage tanks, 7 ft. 11 in. by 39½ ft. long with 18 in. manholes; air compressors; acid traps; nitric acid storage tanks; filters, pumps, valves and ancillary equipment.

The air compressors, by Bellis and Morcom, are of the vertical, two-stage, double-acting type. The gasifier is welded mild steel 2½ ft. by 6 ft. high; the air heater and heat exchanger is of stainless steel, 13½ in. by 14 ft. 2 in. long with a nest of 1 in. diameter tubes; the gas mixer of the same length and 8 in. diameter is of welded nickel; and the converter of nickel lined mild steel and water jacketed stainless steel. The catalyst of 90/10 platinum-rhodium gauge is clamped between the upper and lower parts. The cooler condenser comprises seven banks of hairpin coolers 29 ft. 7 in. long; the oxidation tank of stainless steel is 10 ft. by 3 ft. 11 in. with an 8 ft. horizontal baffle. The cylindrical absorption column, 40 ft. high, is in three stages, of welded stainless steel, as is the 8 ft. bleacher, which has approximately 6 ft. of stainless steel packing. Acid traps are of inverted bucket type. Each plant has a welded stainless steel nitric acid storage tank to hold 65 tons of 60 per cent acid.

Other available plants which are described in detail are :

Sulphuric acid concentration units comprising a chemical cast-iron pot 8 ft. internal diameter by 6 ft. 6 in. deep, with stirrer motor and reduction gear. Fume is carried off to a three-section dephlegmator of tile-lined lead and a domed FeSi cover is fitted with a thermometer pocket and a FeSi connection to a water-spray pump. Acid is fed to the dephlegmator through a lead piano box and a lead lute line. The pot is set in a steel-braced bruck furnace, equipped with a gas burner and sharing an air-fan giving preheated air.

De-nitrating units, each consisting of six towers of acid resisting stoneware. Each section is 3 ft. internal diameter by 3 ft. long. Fume is drawn through the towers by stainless steel fan operated by a 2 h.p. motor.

Ammonia liquor concentration units, capable of producing 250 tons of crude liquor (1 per cent) per day, concentrated to 800 tons of 25 per cent NH_3 per annum (320 working days). The stills have 18 cast-iron trays contained in mild steel welded casing 40 ft. high, with effluent valves.

All this plant and a miscellaneous assortment of other chemical plant, such as degreasers, ovens and stills, are held by the Directorate of Disposals of the Ministry of Supply.

PAPER-MAKING SUBSTITUTES

THE use of substitute materials for papermaking in an effort to maintain wartime production was detailed by Miss Helen M'Kenzie, of the Research Staff of Stoneywood Mills, when she spoke to Aberdeen Rotary Club last week.

The deficiencies of Britain in recognised materials for papermaking gave ample scope and justification for research in this direction. Among the materials used in wartime experiments were heather and bracken, both materials which abound in Scotland, and which have been regarded to date as waste materials.

A usable paper had been made from heather but it had been rather weak and the element of cost of collection of raw materials had been considerable. Bracken had given a yield of 15 per cent but a considerable amount of chemicals were necessary to bleach the paper, making this material an uneconomic proposition. Bent grass, which was found fairly generally on the Scottish foreshores, had given a 10 per cent yield, as against 30/35 from esparto, but here the authorities opposed the cutting of bent grass, in view of the vital function it plays in binding sands on the foreshores and preventing erosion.

New Canadian Oilfield.—Oil has been struck at over 5000 feet depth, 16 miles south of Edmonton, Alberta. It is hoped to establish commercial production, states the *Petroleum Press Service*.

German Technical Reports

THE latest reports on German industry, now obtainable from H.M. Stationery Office at prices indicated, bring the number of B.I.O.S., C.I.O.S., F.I.A.T., etc., reports published to the grand total of 1812. Of interest to all readers are the following:

BIOS 659. *I.G. Farbenindustrie A.G.*: Interview with Dr. Stocklin formerly of the Leverkusen laboratories: Properties, manufacture and use of Buna synthetic rubbers—latest developments (6d.).

BIOS 786. Investigation of methods of development and evaluation of new plastic products in certain German establishments (4s.).

BIOS 986. *I.G. Farbenindustrie A.G.*: Manufacture of intermediates for dyestuffs at Griesheim, Hoechst, Ludwigshafen, Mainkur and Offenbach, Part 1 (24s. 6d.), Part 2 (17s.).

BIOS 1004. X-ray crystallography in Germany and Austria, with special reference to mineralogy (3s.).

BIOS 1007. Instrumentation and control in the German chemical industry (16s.).

BIOS 1038. *Ruhrchemie A.G., Sterkrade-Holten, near Oberhausen, Ruhr*: Methanisation of coal gas and production of acetylene from methane (1s. 6d.).

BIOS 1044. German carbide and cyanamide industry. Carbide production (7s.).

BIOS 1045. German carbide and cyanamide industry. Handling of carbide in bulk (1s.).

BIOS 1051. German acetylene chemical industry. Concentration of dilute acetic acid (2s.).

BIOS 1054. German acetylene chemical industry. Ethyl-aceto-acetate (2s. 6d.).

BIOS 1055. German acetylene chemical industry. Corrosion resistant linings (3s. 6d.).

BIOS 1094. *Ruhrchemie-Ruhrgas*: Process for catalytic enrichment of coal gas by methane synthesis (2s.).

BIOS 1101. Investigation into the German bone glue industry and its by-products (4s.).

BIOS 1105. *I.G. Schkopau*: Interrogation of Dr. Carl Wulff: Plastics and intermediate chemicals (1s. 6d.).

BIOS 1119. Synthetic rubber: Interrogation of Dr. W. Becker, of the Central Rubber Laboratory, Leverkusen (1s. 6d.).

BIOS 1120. German synthetic fibres—wet processing (1s. 6d.).

BIOS 1130. Manufacture of mersolate in Germany. Soap substitute (2s. 6d.).

BIOS 1142. *Wintershall-Schmafeldt*: Process for the manufacture of synthesis at Lutzkendorf (3s. 6d.).

BIOS 1157. *Leverkusen* and *Uerdingen Factories*: German dyestuffs and intermediates industry. Dyestuffs and intermediates (6s. 6d.).

FIAT 608. *Bergwerke Gesellschaft, Hibernia, A.G., Herne*: Oxidation of methane to formaldehyde. Interrogation of Dr. Karl Schmidt (6d.).

FIAT 795. *Auergesellschaft, Berlin*: Lanthanum, neodymium, praseodymium and uranium compounds (6d.).

FIAT 828. *I.G. Farbenindustrie, Leverkusen*: Elemental fluorine (2s. 6d.).

FIAT 886. Manufacture of melamine (1s.).

FIAT 888. *I.G. Farbenindustrie, Oppau*: Methanol synthesis (2s.).

FIAT 905. Determination of suitability of paraffin mixtures for conversion to fatty acids by catalytic oxidation (6d.).

FIAT 913. Synthetic detergent applications (1s.).

FIAT 919. Manufacture of the diethanolamine salt of *p*-methyltolyl carbinol-camphoric acid ester and a brief evaluation of its pharmacologic properties (1s.).

FIAT 935. *Ludwigshafen*: Production of higher vinyl esters (1s.).

CIOS XXXIII—21. Magnesium alloy industry of Eastern Germany (10s.).

The following evaluation reports are also obtainable (2d. each).

BIOS E/R 21. *Klockner Werke A.G.* rolling mills: Metallurgical.

BIOS E/R 272. (a) *Deutsche Gassrusswerke G.m.b.H.*: (b) *Degussa Kalacheuren*: Carbon black for rubber.

BIOS E/R 370. *Degussa Hiagwerke A.G.*: Wood carbonisation and tests for activated carbon.

Germany's Heavy Industries

THE revival of German heavy industries as essential to make Germany ultimately self sufficient and as a necessary contributor to world economy is urged by Mr. Herbert Hoover, former U.S.A. President, in his third report to President Truman on his economic mission to Germany. The belief that the rehabilitation of Germany can be achieved by developing light industries alone he describes as an illusion. If Germany's heavy industries were allowed to function, she would have ability to export and would become an asset in Europe's recovery, contends Mr. Hoover. To persist in the present policies would create, sooner or later, a cesspool of unemployment or pauper labour in the centre of Europe which was bound to infect her neighbours. He recommends that German industry should be freed, subject only to a control commission to ensure she did not revert to warlike production, that the Ruhr and Rhineland must not be divided and that overriding control of industry by Allied Governments should cease.

Chemical Projects in Ceylon

From Our Own Correspondent

Colombo

TECHNICAL experts have arrived in Ceylon to advise the Government on its post-war industrial projects.

Dr. A. J. V. Underwood, well-known British consultant chemical engineer and Chemical Adviser to the East African Government, is here in connection with a number of chemical projects, chiefly the acetic acid factory. Acetic acid manufacture, he states, should be very interesting from the point of view of Ceylon because Ceylon has coconut shells which are a waste material and from which acetic acid can be manufactured, and acetic acid is required for the rubber industry which is one of the principal industries of the island.

There were many problems, added Dr. Underwood, still to be worked out in connection with the building of a large plant. The present plant was a small unit built mainly to get information and experience about the special properties of coconut shells. In the carbonisation of coconut shells to produce acetic acid there were also produced charcoal and other products such as wood naphtha, creosote and pitch. Some of these might have interesting properties and should be investigated further. Wood naphtha was a good solvent and was used in the paint industry. Creosote was valuable in making wood preservatives and disinfectants. Practically all the products of the coconut shell carbonisation plant, said Dr. Underwood, could be consumed in the country.

Experiments in Rubber Technology

The rubber technologist of the Ceylon Government, Dr. A. Sunderalingam, has been experimenting with the preparation of chemically softened rubber for export to manufacturing countries. Softened rubber has a big demand in manufacturing countries and the Ceylon Government is now making arrangements to ascertain their requirements. Dr. Sunderalingam is of opinion that, in view of the shortage of processing machinery and high cost of labour, most manufacturing countries will prefer to pay a premium on softened rubber.

The ultimate intention of the Ceylon Government is to convert most of its rubber into chemically softened rubber so that Ceylon may find an easy market for it in manufacturing countries abroad. In this connection, Mr. Rajah Hewavitarne, Minister of Labour, Industry and Commerce, will shortly ask the State Council to sanction a supplementary vote of Rs. 550,000 for the purchase of machinery for the production of processed rubber on a large scale. Ceylon, hitherto a large producer of raw rubber, will devote more attention in future to the development of an export trade in processed rubber such as sole crepe and creamed latex, which offer lucrative prospects.

The big drop in the price of normal grades of natural rubber and the increasing production of these grades by Malaya and the Dutch East Indies calls for immediate action to develop and expand Ceylon's markets by exporting processed instead of raw rubber. The estimated consumption of the United States in latex alone is 30,000 tons a year. Ceylon's first target is the production of 10,000 tons of sole crepe and 10,000 tons of creamed latex a year.

Meanwhile, the State Council has passed a supplementary vote of Rs. 286,000 to establish a Rubber Service Laboratory in Colombo, which will conduct rubber research work in order to help the rubber industry.

World's Largest Tin Dredge

A FEW interesting facts about the tin dredge "Roosevelt" which was launched at Tampa, Fla., on January 6, for the tin mines in the Netherlands East Indies, are given below:

The "Roosevelt" will excavate tin-bearing sand and gravel to a maximum of 100 ft. below water level, raising the ore on a digging ladder 216 ft. long and weighing, including tackle, approximately 650 tons. The endless bucket line of 148 buckets, each weighing with bucket pin 4025 lb., discharges its load at a height equivalent to about five storeys above the water line into a revolving screen 10 ft. in diameter by 70 ft. in length. A 150 h.p. motor drives the screen by means of a 72 in. drive roller.

For digging barren overburden a removable chute can be placed in the revolving screen permitting the material to by-pass the treatment plant by means of a chute which discharges 120 ft. astern. Distributor and disposal sluices will be lined with a special rubber composition vulcanised to the plates.

Water required for washing and sluicing of ore on the giant dredge is provided by six 12-in. and one 5-in. electrically driven pumps, including stand-by pumps. A total of 1,500,000 gallons of water per hour is the normal requirement of the dredge. All dredge operations are handled by electric and hydraulic controls with practically all control equipment automatic so that the operator has very little to do except handle the control for the various motors.

CHEMICAL ASPECTS OF NORWEGIAN INDUSTRY TO-DAY

Specially written for THE CHEMICAL AGE by the Studieselskapet for Norsk Industri (Norwegian Industries Development Association), Oslo

THERE are two notions about Norway which are prevalent abroad. One is that it is a beautiful country, the other that the population is maintained for the most part by the fishing trade and by agriculture.

The first of these propositions is undoubtedly true, and the other was true once upon a time. But it no longer holds good to-day. Industry has in many respects become the most important source of livelihood. This is due to the existence in Norway of valuable minerals, of timber and of water power, which is converted into electricity.

The object of the present article is to give a short account of the present position of Norwegian industry from the chemical point of view.

The annual consumption of steel in Norway in the years 1937-39 was about 280,000 tons, inclusive of all types and qualities. The production of the existing iron and steel works (*Christiania Spigerverk A/S* and *A/S Bremanger Kraftselskab*) is from 38,000 to 40,000 tons per annum. The difference between consumption and home production has hitherto mostly been made up by the import of semi-manufactured iron. It is estimated that Norwegian requirements will increase considerably in the years to come, in view of the fact that the present steel consumption represents only about 100 kg. per head, whereas in Sweden it is 200 kg., in England 300 kg., and in the United States 500 kg. per head

New Iron Works

Plans for the erection of a pig-iron plant, combined with steel works and rolling mills, have recently been adopted by the Norwegian *Storting*, after careful investigation of the economic conditions and in close consultation with the industrial interests concerned. The intention is to build a plant with an initial capacity of 200,000 tons. The site of the new iron works will probably be at Mo in Rana (between Trondheim and Bodo). The electric power will be supplied by the *Glomfjord Elektrisitetsverk*, which is capable of delivering 70,000 kW.

Production is to be based on iron ore and purpleore which will be sintered in Greenawalt pans. As the supply of scrap iron is small, the calculations do not include any extensive use of this raw material, apart from the waste from the rolling mills. Pig iron is to be produced in electric furnaces of the Tysland-Hole type, each having three to six electrodes. The consumption of electricity will be from 2300 to 2500 kWh per ton. It is estimated that half the output will consist of Bessemer steel delivered in blocks for further manufacture, while the remainder will pass from the converter to electric steel furnaces for further refinement, with a view to its ultimate use in sheets for shipbuilding.

In all the electric smelting furnaces the Soderberg continuous electrodes will be used, total consumption of electrode paste being expected to be about 3000 tons per annum. This will be supplied by *A/S Fiskaa Verk*, Kristiansand S., which has an annual capacity of 18,000 tons.

Calcium Carbide Production

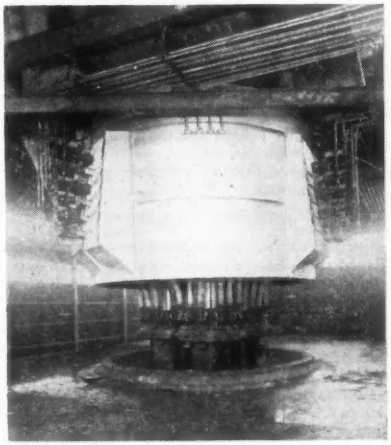
There are four factories in Norway producing calcium carbide. Before the war the annual export amounted to 69,000 to 76,000 tons. Most of it went to England, where it was made into acetylene and then, in part, converted into chemical products. This market has now become closed, as during the war an extensive carbide industry was created in England and Canada. Under these circumstances it is natural that plans are being considered for the manufacture of synthetic chemical products from acetylene in Norway. Before the war, Norway produced for export 35,000 to 40,000 tons of calcium cyanamide, a large proportion of which went to England.

For most chemical processes which use calcium cyanamide as the basic material, a natural intermediary stage is that of dicyandiamide. It may be expected, therefore, that this product will shortly be put upon the market by one of the manufacturers of calcium carbide.

The making of ferro-alloys is one of the principal export industries of Norway. In 1939 more than 146,000 tons were produced. Of the various kinds of ferro-alloys the following quantities were exported: ferro-silicon, 41,000 tons; ferro-chromium, 16,000 tons; ferro-manganese, 67,000 tons; ferro-silico-manganese, 22,000 tons; other ferro-alloys, 400 tons. All the chromium and manganese ore used in the manufacture has to be imported. This is, however, not such a serious drawback, as the plants are

situated near the sea. All of these were so fortunate as not to suffer any war damage, for which reason their productive capacity is unimpaired. In all the plants Soderberg electrodes are used, except in connection with certain refining operations.

An interesting development in recent years is the Elkem rotating hearth furnace (type Ellefsen), which has been used by *Elektrokemisk* at *Fiskaa Verk*, Kristiansand S., since 1936. It was described by Mr. Tonnes Ellefsen in *Transactions of the American Electrochemical Society*, April, 1946. Two other factories have now adopted this type of furnace.



A 6000 kW rotating hearth furnace at Fiskaa Verk, Kristiansand.

The aluminium industry has also retained its productive capacity during the war. The output in 1938 was 29,000 tons, to the value of 45 million kr. The raw material is alumina, Al_2O_3, which for the most part is imported. Only *Norsk Aluminium Co. A/S*, Hoyanger, has its own alumina plant, where bauxite is used as raw material, according to the Pedersen process.

During the occupation the Germans planned an enormous development of the Norwegian aluminium industry. A scheme was worked out for the production of 150,000 tons of aluminium per annum, or even more. In furtherance of this, water power was harnessed at top speed and at enormous cost and several reduction plants were in course of construction. "Nordag," a company started by the Germans during the war, alone spent 1100 million kr. on such developments, but succeeded only in completing an extraction plant for Al_2O_3 at Saudasjøen, where the output was 20,000 tons Al_2O_3 per annum. At Aardal, on the Sognefjord, 87,000 kW was developed, and an aluminium reduction plant was nearly finished with one series, equivalent to about 12,000 tons of aluminium per annum, when the war ended. These plants have now been handed over to a government-controlled company—*A/S Aardal Verk*—where aluminium will be produced from alumina. The latter material will either be made at Saudasjoen or imported.

Among other electro-chemical products mention must be made of silicon carbide, which is manufactured by the *Arendal Smelteverk*, perhaps the largest producer of this material in Europe. The plant has a capacity of 6000 to 7000 tons of Sicarbide per annum. It is sold under the name of "Sika" in different sizes of grain for the manufacture of grindstones, etc. A special micro-grain size is produced for grinding purposes in connection with the optical industry.

Pulverised water glass is now manufactured in Norway, and the production will soon be 3000 to 4000 tons, which corresponds to the needs of the Norwegian market.

In the manufacture of synthetic nitrogen, Norwegians may be said to be pioneers. The method of producing nitric acid and nitrates by burning the nitrogen of the air in an electric arc furnace was invented by Professor K. Birkeland and Mr. Sam Eyde, civil engineer. In 1905 the *Norsk Hydro-Elektrisk Kvælstofaktieselskab* was formed, with Mr. Eyde as director-general, and this was the first company to produce these chemicals on a commercial scale by the new method. *Norsk Hydro* has now abandoned the electric arc method and adopted instead the method of ammonia synthesis, which is the one generally used in this field.

Nitrogenous Products

The hydrogen used in the manufacture of ammonia is obtained by electrolysis of water. *Norsk Hydro* has the largest electrolytic hydrogen plant in the world, with an electric power consumption of about 174,000 kW direct current. An extension is now being built which will bring this figure up to 210,000 kW. The company has at its disposal about 300,000 kW from its own power stations. The total production of nitrogenous products at *Norsk Hydro* is about 100,000 tons of pure nitrogen, divided between three plants located at Rjukan, Notodden and Herøya. In addition to the ammonia plant, there is a sack factory covering the company's entire requirements of impregnated and non-impregnated sacks. The chief activity of *Norsk Hydro* is the manufacture of fertilisers. These are nitrate of lime, "Calnitro," "Dolomitic Calnitro," sulphate of ammonia,

" Complete Fertiliser " and nitrate of soda. The latter is made by a base exchange process, in which sea water is the source of sodium.

In addition, the company markets several nitrogenous products for technical purposes, such as anhydrous ammonia, nitric acid of different strengths, ammonium nitrate, salt of hartshorn, and certain by-products such as carbonic acid, liquid and solid, rare gases and heavy water. *Norsk Hydro* also operates a soda ash factory, situated at Herøya.

The Norwegian export of the main nitrogen products in 1939 was as follows: Calcium nitrate, 406,000 tons; nitric acid, 6760 tons; sulphate of ammonia, 9500 tons; nitrate of ammonia, 2200 tons; sodium nitrate, 37,000 tons.

The Norwegian zinc industry at Eitrheim is a modern industry which has already proved its vitality and efficiency. Before the war the normal export of zinc amounted to 40,000 tons per annum.

The nickel- and copper-refining industries are well developed in Norway, and before the war 10,000 to 11,000 tons of raw copper and 9000 tons of nickel were exported annually. There are three plants engaged in the production of copper. Two of these use the method of reduction from copper-iron-ore. The third refines copper-nickel matte electrolytically. The import of Cu-Ni matte in the years before the war amounted to 14,000 tons, and was obtained for the most part from Canada. SO_2 is a by-product from the gases obtained in the nickel-refining industry. It is sold in compressed form to the sulphite pulp factories. The production is approximately 4000 tons per annum.

In this connection it may be mentioned that *Orkla Grube-Aktiebolag* produces elemental sulphur by reduction of gases from sulphur pyrites. The pre-war output was 70,000 to 100,000 tons, with a maximum capacity of about 140,000 tons. Most of this sulphur went to the sulphite pulp industry for production of sulphite boiling acid.

Sulphuric Acid Production

Sulphuric acid is produced at three plants, according to the contact process by the roasting of pyrites. The output before the war was approximately 12,000 tons. The capacity, however, is considerably greater, one plant alone being able to produce about 30,000 tons. In order to utilise this excess capacity, plans are being considered for the construction of a new superphosphate plant, with a potential output of 40,000 to 45,000 tons. This would bring the Norwegian superphosphate production up to 70,000 to 80,000 tons. Sodium silico fluoride is produced at one of the plants as a by-product.

Chlorine and sodium hydroxide are made electrolytically at two plants. Two new plants are under construction which in the first instance will be capable of producing 10,000 to 11,000 tons of chlorine and an equal quantity of NaOH. A considerable part of the NaOH will be used in the manufacture of staple fibres.

Metallic sodium was formerly produced by a factory at Vadheim, but, owing to the poor demand for this chemical, the factory has now changed over to the production of chlorates, etc., for weed-killing purposes.

The wood-refining industries are among the most important in the country. Their annual output represents a value of 400 to 450 million kr. and their exports 200 million kr. No other industry's exports amount to so large a sum. The annual consumption of timber in Norway before the war was 9 to 9½ million cu. m. A large part of this was, however, used as fuel and for building purposes. The amount actually used by the wood-refining industries was: chemical pulp, 2.6 million cu. m.; Mechanical pulp, 1.2 million cu. m.; sawn goods, 2.5 million cu. m.

Timber Yields

Owing to lack of labour in recent years it has not been possible to produce more than 30 per cent of the normal output of timber. Though production last year was a little better, it was not much in excess of 50 per cent of normal capacity. However, it is hoped that this year there will be a great improvement in this respect.

Investigations have shown that by use of rationalised methods the yield of the Norwegian forests can be increased very considerably. It is estimated that the total quantity of timber available each year could be raised by 50 per cent in the course of 50 years. Great importance is attached, therefore, in Norway to proper methods of forestry, timber felling, logging and floating.

Before the war the following quantities of chemical and mechanical pulp and pulp products were manufactured annually: sulphite pulp, bleached 206,000 tons; sulphite pulp, unbleached, 105,000 tons; sulphate pulp, 60,000 tons; mechanical pulp (50 per cent), 885,000 tons; wrapping paper, 95,000 tons; printing paper, 204,000 tons; writing paper, 23,000 tons; cardboard and carton, 41,000 tons.

In view of the great demand for foreign currency since the war, it is natural that the wood-refining industries should try to carry the manufacturing process further toward the more valuable finished products. A first-class bleached high-alpha sulphite pulp is now, for instance, being made in Norway for the production of cellulose acetate and for other chemical purposes. There is also a factory for the

manufacture of rayon, with a capacity of 1500 tons a year, and a staple fibre factory capable of producing 9000 tons a year. It is also expected that some of the largest chemical pulp factories will in the near future take up the production of other derivatives from cellulose.

An interesting question for the chemical pulp industry has been what use could be made of the large quantities of waste sulphite liquor which hitherto has been allowed to flow into the sea. In order to solve this problem efficiently, the Norwegian sulphite pulp factories have combined on a joint plan. It is intended to concentrate the waste liquor and utilise it as fuel. In this way it should be possible to save from 100,000 to 150,000 tons of coal annually. From the same product it will be possible to gain 40 to 45 million litres of 96 per cent ethyl alcohol, as compared with the 9 million litres now produced. The spirit thereby made available will partly be used in combination with petrol as a motor fuel. A large quantity will, however, also be used for the production of certain organic chemical compounds.

Pulp By-Products

Among the by-products of the chemical pulp industry tall-oil must be mentioned. This is derived from the sulphate liquor and consists of fatty acids, abietic acids and certain neutral oils. The fatty acids have proved very useful in the manufacture of paint, lacquer, glyptal lacquers and soft soap. The resin acids, which are crystallised and very pure abietic acids, are a useful accession to the lacquer factories. They are also used in the manufacture of paper.

As a by-product of the cellulose industry, a special lignin product is obtained which has excellent qualities as tannin material. By use of a special boiling process for sulphite pulp at *Toten Cellulosefabrik*, with ammonium as base instead of calcium, a sulphite liquid is obtained which can easily be evaporated to an ash-free tannin material. This lignin product is produced in quantities up to 7000 tons, and has proved to be of great importance. Production will be expanded to 12,000 tons per annum in the near future. The wood-refining industries have a modern research laboratory (*Papirindustriens Forsknings-institutt*), which has already done much to promote development in this industry.

Norway has two factories engaged in the manufacture of explosives. Production is based on the supply of nitric acid from *Norsk Hydro.*, while toluene and most of the glycerine have to be imported. At one time cotton was also imported for making cellulose nitrate, but a specially prepared wood celluluose is now used for this purpose. In this connection it may be mentioned that cellulose nitrate now is made for the production of lacquers of good quality.

An industry which has had great development in recent years is the refinement of oils and fats. The raw material is obtained from whales, herrings and codfish. The Norwegian whaling industry supplies the necessary whale oil. The animals, when caught, are processed in large floating factories. The meat, bones and blubber are boiled in steam-heated boilers. Whale oil has the following physical and chemical properties: Specific gravity (15°), 0.920 to 0.927; saponification value, 180 to 197; iodine value, 105 to 135; refractive index (40°), 1.4630 to 1.4710; titre of fatty acid, 22 to 25; insoluble bromide value, 25 to 30; acid value, upwards of 1. The world output of whale oil prior to the war was nearly 660,000 tons yearly. Of this quantity the Norwegian whaling fleet contributed about 200,000 tons of which 150,000 tons was sold direct to other countries.

To make the oil edible and suitable for soap manufacture it has to be subjected to processes of purification, decoloration and hydrogenation. The oil is first refined with lye, whereby free fatty acid and impurities are removed. Next it is washed, dried and bleached with bleaching earth, and then filtered. The light oil is treated with hydrogen in an autoclave, in the presence of a metal catalyst, whereby the unsaturated links of the oil are hydrogenated and a higher melting fat is formed. The filtered fat is then again refined and bleached and, finally, subjected to a deodorising process.

Refined and hydrogenated whale oil is in great demand as a constituent of margarine, lard compound and soap. The Norwegian factories produce about 55,000 tons yearly of hydrogenated fat, but they have a capacity of 130,000 to 140,000 tons. The original iodine value of whale oil is between 110 and 120. The softest parts are used for making soap, the intermediate types for making margarine, and the hardest types for making wax candles and fine soap

(*To be continued*)

Steel Allocation

There will be no restrictions on the use of steel by some sections of industry which have been given priorities for steel allocation. They include manufacturers of electricity generating plant, machinery and equipment for deep-mined and open-cast coal production, plant and equipment for gas undertakings and the coal oil conversion programme, locomotives and wagons, and atomic energy. These sections have been told they can have as much steel as they want "within reason."

British Aluminium Company

Reduced Demand for Metal

AT the annual general meeting of British Aluminium Co., Ltd., the chairman, Mr. R. W. Cooper, M.C., stated that production at the company's Alumina Works during the year was at approximately 60 per cent of maximum capacity. They had now no demand for alumina from Norway and were therefore unable to make full use of capacity, despite increased demand for alumina for chemical and other purposes.

In view of the necessity for economies and for reducing alumina costs, the works at Larne in Northern Ireland had been closed down after 50 years' operation.

All three reduction works in Scotland had worked at full output throughout the year. He pointed out that aluminium produced in their reduction works in this country since the company's formation had passed the half million mark.

Acquisition of the rolling mill at Falkirk, among other assets, provided a mill unexcelled in Europe for production of large quantities of sheet and strip to standard specification.

Referring to the purchase in the previous year of works at Latchford Locks, Warrington, designed for the re-melting of scrap and blowing of aluminium powder, the chairman said secondary metals were playing an increasingly important part in their industry; and to safeguard future needs of these works they had purchased a very large quantity of scrap and redundant aircraft. To balance the powder blowing capacity, they were installing plant for the manufacture of flake powder paste for paint.

On the subject of the price of aluminium, Mr. Copper commented:

"The Government is still the sole purchaser and seller of virgin aluminium ingot, and our position *vis-à-vis* supplies to them is obscure and causes us grave concern. It has been stated in a report by the Select Committee on National Expenditure that there is an element of subsidy in the price paid to this company, and it has also been reported in the Press that it was possible for the Government to reduce the price of aluminium, on the occasion when this was last done, owing to a very favourable and large contract made with Canada.

"From this you will appreciate that the price which is being paid to this company has been in excess of that paid to Canada, whose costs of production are well below any other country in the world for a number of reasons, not the least of which is a power cost which, due to natural causes and in no small degree to the Canadian Government's allowance of heavy writing down during the war, is extremely low.

"The Government appear to regard the price obtainable in that market as a yardstick and to ignore the fact that costs of production in this country are probably at least as low as anywhere in the world outside North America. Last year we had considerable difficulty in negotiating a satisfactory contract, and this year we are having even greater difficulty. . . ."

As already announced [THE CHEMICAL AGE, March 29, p. 393] the company's trading results were more satisfactory than in the preceding year.

Scottish Coal Distillation Plan

PLANS for the establishment in Lanarkshire of an industry to employ 2000 producing and processing coal products are being strongly advocated by the Scottish Reconstruction Committee, of which Mr. James H. Macaulay is chairman. The committee recommends that the first plant should cost between £250,000 and £300,000, and be one of a chain of five similar plants erected in the Lanarkshire area to treat the processing of coal and its derivatives on the lines of the most advanced technique.

An outline of the project was included in a resolution sent to the National Coal Board from a meeting which the committee held in Glasgow recently with Lanarkshire experts, the National Coal Board, Shotts Development Association, and Lanarkshire Trades Council. Copies have been sent to the Prime Minister and Cabinet Ministers concerned. It is stated that the plant could be in full operation in less than three years.

Distillers to Develop Plastics

EXPENDITURE of £1,250,000 with a view to the erection of a new factory for British Resin Products at Barry, South Wales, adjacent to the factory being constructed for British Geon (in which the Distillers Co. has a 55 per cent interest) is among plans recommended by the board of Distillers Co., Ltd. Other important developments proposed are the purchase of shares in British Industrial Solvents, formerly German-held, making the company a wholly-owned subsidiary; expenditure of £2,000,000 with a view to expanding output at the Hull works of British Industrial Solvents, Ltd., and reorganisation of the plastics section of the company with a view to the concentration in the wholly-owned subsidiary, British Resin Products, of the activities of the wholly-owned subsidiaries, Cellomold, Ltd., Extruded Plastics and Indurite Moulding Powders, all to be voluntarily liquidated.

A CHEMIST'S BOOKSHELF

Annual Report on the Progress of Applied Chemistry, 1945. Vol. XXX. London: Society of Chemical Industry. Pp. 434. 20s.; to members 11s. 6d.

In spite of many still prevailing restrictions this volume continues to be as comprehensive as in previous years and the abbreviated list from its 26 chapters illustrates best the exhaustive completeness of the contents: Chemical Engineering, Plant and Machinery; Fuel; Tar and Tar Products; Mineral Oils; Fibres, Textiles, and Cellulose; Refractories and Cement; Iron and Steel; Non-Ferrous Metals; Fats, Fatty Oils, and Detergents; Plastics; Resins; Rubber; Agriculture and Horticulture; The Fermentation Industries; Foods; Photographic Materials and Processes. There are, of course, many more.

The reports and surveys contributed by 52 well-known authorities are coping with the greatest attention and thoroughness with the ever-rising flood of scientific literature, abstracts and reviews and make the book an invaluable work of reference completed with a comprehensive name and subject index and with abundant footnotes.

The Society of Chemical Industry and the editor of and contributors to these reports which have gained international reputation are to be congratulated on this excellent survey of applied chemistry.

F. NEURATH.

Portland Cement Technology. J. C. Witt. Pp. viii + 518. The Chemical Publishing Co., Inc., Brooklyn, New York. $10.

It has been claimed before now that half our present civilisation, in its material aspects at least, rests on cement. That possibly is an exaggeration, but the most cursory examination of what has been achieved in the fields of building and transport in all its forms suggests that the adage does not greatly outstrip the truth. Dr. Witt's *Portland Cement Technology* is accordingly a timely publication, correlating as it does the most exhaustive body of information from all sources about the production, properties and uses of Portland cement, generously illustrated and furnishing a bibliography which surveys every aspect of the subject not treated at length in Dr. Witt's pages. Starting from the earliest known uses of cement, of which the historical Romans' "Pozzolana" variety was by no means the first, the writer has provided an exceptionally detailed study of the subject from the standpoints of the chemist and research worker, the cement manufacturer and engineer, and has not forgotten the user of cement, for whom is provided standard specifications and much useful data exactly recorded. An indispensible reference book for any technician concerned with cement.

Dictionary of Plastics. By Paul I. Smith. London: Hutchinson's Scientific and Technical Publications. 1947. Pp. 168. Price 15s.

This book is a practical and much needed supplement to the vast literature on plastics and differs from all other books in this field in that it is free from theory and generalisation. The aim of this dictionary is to supply the facts relating to plastics in a concise and accurate form, making available to raw material manufacturers, moulders, fabricators and the consumers a handy reference book. The references selected for insertion are substantiated partly by chemical formulas and by details of literature and manufacturing firms. In addition a bibliography is given at the end of the dictionary of books, periodicals and house journals of companies. Thus the book is full of sound information of the greatest value to all concerned in any practical applications and developments of these new materials of to-day and tomorrow.

Organic Chlorine Compounds

A new booklet, "Organic Chlorine Compounds," presenting the latest data on twelve chlorinated compounds, industrially important as solvents, fumigants, and chemical intermediates, has just been published by Carbide and Carbon Chemicals Corporation. It is one of a series of publications on the various groups of aliphatic organic chemicals. Information is given on the properties and uses, specifications, solubilities, comparative stability to reducing and oxidising agents, and constant boiling mixtures. The booklet also contains charts showing the variation of certain properties with respect to temperature. A comprehensive bibliography is included. Copies may be obtained by writing to Carbide and Carbon Chemicals Corporation, 30 East 42nd Street, New York 17, N.Y., and asking for Form 4769.

Parliamentary Topics

Not Yet.—The Minister of Supply, in a written answer to Mr. A. Edwards, said he was not in a position to make a statement on the nationalisation of the steel industry.

Plant on Loan.—Between February 17 and March 20, 454 applications for the loan of electrical generator sets were approved by the Board of Trade and 295 applicants were offered sets.—Mr. Belcher.

More Dollar Purchases.—Twenty per cent of Britain's raw materials imports in 1946 came from the U.S.A. and Canada at a cost of $275 million. The proportion this year will be higher and the cost may be around $500 million—The President of the Board of Trade.

Soda Ash Shortage.—"I appreciate the difficulty about soda ash, and we have it well in mind." Sir Stafford Cripps gave this reply to Mr. Dodds-Parker's question as to what steps his department was taking to prevent a shortage of milk bottles arising because of the curtailment of soda ash deliveries. It was suggested by Mr. C. S. Taylor that soda ash shortage had caused the closing of several large bottle manufacturers. Sir Stafford said he was not aware of this; the average rate of production had in fact risen since the end of last year.

Low Temperature Carbonisation.—The Parliamentary Secretary to the Ministry of Fuel (Mr. H. Gaitskell) gave no answer to Sir Waldron Smithers' repeated question, would the Minister receive a deputation representing the low temperature carbonisation industry to put their case for increased allocations of coal, in view of the very important by-products and fuel this very young industry was producing. Mr. Gaitskell said the Minister had also to consider vital by-products which would be lost if coal were diverted from other industries and a further difficulty was that low temperature carbonisation did not produce gas in sufficient quantities.

TAR DISTILLERS' NEW OFFICERS

[*Continued from p. 434*]

A. Bradbury and Mr. G. F. Peirson (N. Midlands); Mr. Stanley Robinson and Mr. W. H. Phillips (S. Midlands); Mr. S. Roberts and Major A. G. Saunders (London and S.E. Counties); Mr. H. H. Bates and Dr. T. H. Butler (S.W. Counties); Capt. C. W. Harriss, hon. treas., and Mr. C. F. Dutton (Wales); Mr. E. Mardman (Smaller distillers' representative); Col. W. A. Bristow (Low temperature tar distillers' representative). The immediate past-president is Mr. S. Billbrough (Yorkshire Tar Distillers, Ltd.).

Next Week's Events

MONDAY, APRIL 14.

Society of Chemical Industry (London Section). Chemical Society's Rooms, Burlington House, Piccadilly, W.1, 6.30 p.m. Professor R. P. Linstead: "Chemistry and Autarchy."

Oil and Colour Chemists' Association (Hull Section). Royal Station Hotel, Hull, 6.30 p.m. Dr. W. Charlton and Dr. L. F. Perrins: "The Hardening of Phenol Alcohols and Their Reaction with Drying Oils."

WEDNESDAY, APRIL 16.

North-Western Fuel Luncheon Club. Engineers' Club, Albert Square, Manchester, 12.30 p.m. Sir Frank E. Smith: "Oil in the Middle East."

Society of Chemical Industry (Food Group). Wellcome Research Institution, 183 Euston Road, London, N.W.1, 6.30 p.m. Dr. D. W. Kent-Jones: Modern Trends in Cereal Chemistry in America and Elsewhere."

Institution of Factory Managers. Bonnington Hotel, Southampton Row, London, W.C.1, 6.45 p.m. Colonel L. Urwick: "Education for Management."

THURSDAY, APRIL 17.

The Chemical Society (London Section). Burlington House, London, W.1, 7.30 p.m. Discussion, "Electrolytic Solutions," arranged by Professor C. W. Davies, introduced by Dr. G. S. Hartley. Professor C. W. Davies: "Associations of Ions in Salt Solutions"; Professor W. F. K. Wynne-Jones: "Interaction Between Ions and Solvent."

Pharmaceutical Society. Council Chamber, Houldsworth Hall, Manchester, 7.45 p.m. Annual general meeting.

British Ceramic Society (Building Materials Section). Midland Hotel, Derby, 9.40 a.m.-4.30 p.m. Spring meeting.

FRIDAY, APRIL 18.

Institute of Physics. Manchester University, 7 p.m. Mr. D. O. Sproule: "Material Testing by Supersonics."

Society of Dyers and Colourists. Gas Department Showrooms, Manchester, 6.30 p.m. Dr. G. L. Royer: "Rayon Dyeing."

Society of Chemical Industry (Plastics Group). Chamber of Commerce Building, New Street, Birmingham, 6.30 p.m. Dr. H. P. Standinger: "Vinylidene Chloride and its Polymers."

Society of Dyers and Colourists (Midlands Section). King's Head Hotel, Loughborough. Dinner and social evening.

Home News Items

Tenders for Enemy Shares.—On March 4 the Board of Trade invited tenders for the sale of certain enemy-owned shares held by the Custodian for Enemy Property. It now announces that the due date for tendering has been altered from April 15 to April 29, 1947.

Tin Agreement with Siam.—The tin agreement between Britain, the United States and Siam, signed in Bangkok on December 7, has been renewed for three months. The agreement made available for export 16,000 tons of Siamese tin accumulated during the war, allocating half to the United States and half to Britain and Australia.

"Associate Scientists."—The institution of an associate membership "open to any person in sympathy with the aims of the Atomic Scientists' Association," full membership of which is restricted to scientists with specialised knowledge of atomic energy, is announced. Associate members, for whom the minimum annual subscription is one guinea, will receive all literature issued by the Association and will be invited to express their views about policy.

Ramsay Memorial Fellowship. — The trustees of the Ramsay Memorial Fellowship Trust announce that they will consider at the end of June applications for one fellowship for chemical research of £300 a year, to which a grant of not more than £50 a year for expenses may be added. Applications should be sent to the joint honorary secretaries at University College, Gower Street, London, W.C.1, before the end of May.

Blast Furnaces Close.—The closing is announced of the Shotts Iron Company's furnaces, which for more than a century have played a notable part in the Scottish pig-iron industry. The company was founded in 1801 and built up a reputation producing high-grade iron from the local black band ironstone and local coal. Nationalisation of the coal industry, shortage of fuel and high transport costs are factors which influenced the close-down.

"Enterprise Scotland."—The scope and enterprise of all phases of Scottish industry will be reflected in the "Enterprise Scotland" exhibition which the Scottish Committee of the Council of Industrial Design is to organise in Edinburgh in August and September. In addition to the main exhibition, separate displays of the same character as the "Britain Can Make It" will be arranged in shop windows. Chairman of the Scottish committee will be Sir Stephen Bilsland.

More Coal for Industry.—The Government has decided to give industry an additional allocation of 100,000 tons of coal a week until the end of May.

Coal for Textile Industry.—Coal allocations to the Yorkshire wool textile industry are to be increased from 33⅓ per cent to 50 per cent of the basic allowance, the Yorkshire Regional Board for Industry announced on April 2.

Explosion at I.C.I.—The bursting of high-pressure steam joints in an ammonia plant is believed to have been the cause of an explosion and fire last week which shattered windows but caused no casualties at the I.C.I. works at Mossend, Lanarkshire.

Centenary Exhibition.—A "cultural festival" combined with an exhibition of design similar to the "Britain Can Make It" is suggested by Sir Stafford Cripps, President of the Board of Trade, to commemorate in 1951 the centenary of the Great Exhibition, since a full-scale international exhibition is now considered not practicable.

Linseed Substitute.—Wider use of styrene—the crude oil derivative which substitutes for linseed oil in paint manufacture—is expected as a result of the release by the Exchequer of dollars to purchase substantial supplies of the chemical in the U.S.A. The styrene will be shared by Lewis Berger and Sons and 12 other large paint manufacturers who use the styrene process on a royalty basis.

Laporte's New Works.—Warrington Town Council decided on April 1 to raise no objection to an application which is to be made by the firm of B. Laporte, Ltd., of Luton (Beds.) to the Ministry of Agriculture and Fisheries for authority to build upon about nine acres of land at Morley Common, Warrington, and to add to the common an equivalent value of land. The firm want the land for the construction of their new works, and intend to produce hydrogen peroxide aided by the vast underground supply of saline water in that locality.

Higher Prices for Tin Producers.—The Ministry of Supply is to pay higher prices for tin purchased from Malayan and Nigerian producers. The former are to receive an increase of £53 per ton and the latter an increase of £48 5s. per ton. According to the official statement, the buying price for Malayan metal is increased from £370 to £423 per ton at smelters' works: and the buying price for Nigerian concentrates is increased from £375 10s. to £405 15s. per ton of tin in ore f.a.s. Nigerian port. The selling price of Malayan metal is raised to £426.

Personal

MR. T. R. NAYLOR, M.A. (Contab.), has joined the staff of Dorr-Oliver Co., Ltd.

MR. S. T. MARTYN, of Penarth, iron ore importer, left £75,612, net £71,114.

MR. JAMES SELLER HUTCHISON, a director, has now become vice-chairman of British Oxygen Co., Ltd.

MR. W. W. FOSTER, general works manager at Fort Dunlop, left on April 11 on a visit to the Dunlop factories in the United States and Canada.

MR. J. ORMROD, commercial manager, and MR. P. TAYLOR, production manager, have retired from the board of Vantona Textiles, Ltd.

MR. ROGER W. OSBORN has been appointed general manager to Milton Antiseptic, Ltd., in succession to Mr. A. Ernest Berry, who is now managing director. Mr. Osborn had for some years been with Brand & Co., Ltd

MR. E. T. FOWLER, B.Sc., A.R.T.C., of the Faculty of Technology, University of Manchester, is appointed in place of the late Dr. Donaldson as chief metallurgist and chemist with Scott's Shipbuilding and Engineering Co., Ltd.

DR. OTTO ROBERT FRISCH, head of the nuclear physics division of the Atomic Energy Research Establishment at Harwell (Berks), is to receive the honorary degree of Doctor of Science from the University of Birmingham at its degree-day ceremony in July.

MR. A. J. PHILPOT, C.B.E., M.A., B.Sc., F.Inst.P., Director of the British Scientific Instrument Research Association, has been appointed Director of the Scientific Instrument Manufacturers' Association of Great Britain, Ltd., as from April 1, 1947, at the same time continuing in his office as Director of the British Scientific Instrument Research Association.

DR. G. MALCOLM DYSON, who is now in the United States attending a series of meetings of the American Chemical Society, at which he is to lecture on his new system of notation for organic compounds, has accepted the presidency of an international commission under the auspices of the International Union of Chemistry to report on ciphering and its related subjects.

MR. JOHN ERNEST HEWLETT, J.P., Lynton, Brooklands Road, Baguley, deputy-chairman of the Anchor Chemical Co., Ltd., Clayton, Manchester, a director of the United Oil and Natural Gas Products Cororation, Ltd., Clayton, brother of Mr. T. H. Hewlett, formerly M.P. for Manchester Exchange, left £98,731, net £94,396. He left legacies to employees of the Anchor Chemical Co., Ltd., according to length of service.

A diploma of honorary membership of the Society of Dyers and Colourists has been conferred upon DR. C. J. T. CRONSHAW, past-president of the society and a director of I.C.I., Ltd.; gold medals have been awarded to MR. H. H. BOWEN, director and chief chemist of Bradford Dyers' Association, Ltd., and DR. H. H. HODGSON, principal of the Departments of Chemistry and Colour Chemistry at Huddersfield Technical College.

Engineer Vice-Admiral SIR HAROLD BROWN, G.B.E., K.C.B., to be chairman of the Fuel Research Board, and SIR EDWARD SALISBURY, C.B.E., D.Sc., F.R.S., to be chairman of Forests Products Research, are among the Lord President of the Council's new appointments to chairmanships in the Department of scientific and Industrial Research. Sir Harold, who has just resigned the post of Senior Supply Officer, Ministry of Supply, was during the war Controller General of Munitions Production; he now succeeds Sir Harold Hartley. Sir Edward, who succeeds Professor V. H. Blackman, is a botanist; he is Director of the Royal Botanic Gardens, Kew, and secretary of the Royal Society.

Obituary

GENERAL SIR JOHN PHILIP DU CANE, Governor and Commander-in-Chief of Malta from 1927 until 1931, who has died at the age of 81, was deputy-chairman of De Beers Consolidated Mines and, in addition to holding directorships of a number of diamond concerns in the De Beers group, was on the board of African Explosives & Chemicals, Ltd., and Cape Explosives, Ltd.

The death has occurred in a nursing home of MR. OSBOURNE RONALD HATRICK, who was for many years associated with the firm of W. & R. Hatrick, Ltd., manufacturing chemists, Glasgow, which was founded by his grandfather. He had been retired from business life since 1937. Mr. Hatrick was well known in the Trades House of Glasgow and was a former Deacon of the Incorporations of Skinners. In 1927 he became a governor of the Glasgow and West of Scotland College of Domestic Science, and was convener of the finance committee for eight years before succeeding the late Sir Andrew Pettigrew as chairman of governors in 1942.

Staff Dinner

Messrs. J. F. Farwig & Co., Ltd., of 208/124 York Road, Battersea, London, S.W.11, held a staff dinner at the Piccadilly Hotel on Saturday, March 29. Among those present were Mr. E. D. Warren, chairman, Mr. C. Spengler and Mr. C. W. Tomlinson, directors.

Overseas News Items

Austrian Industrial Mission.—An Austrian industrial mission led by Dr. Wilhelm Taucher, of Graz University, is visiting Britain soon.

Norwegian Plastics Plant.—The Norwegian Artificial Resin Co., a new venture, is to erect a plant at Lillestrom, near Oslo, for the manufacture of moulding powder, lacquer resins, and glue.

U.S. Government Rubber Monopoly.—President Truman has signed an act extending for one year his Government's monopoly and allocation control of crude rubber imports and also the synthetic programme.

Ceylon Rubber Inquiry.—The commission appointed by the Governor to inquire into the state of the rubber industry in Ceylon and to recommend a policy of re-planting and new planting has started its sittings.

French Power Plant Reconstruction.—The principal power plant of the French Dunlop undertaking in Montlucon has been reconstructed at a cost of frs.600,000,000 and power production capacity is restored to pre-war level. Use of synthetic rubber has practically ceased.

Canadian Paint Exports.—Canadian paint manufacturers may now choose their export markets, under permit, the export control of paint products, hitherto by country allocations, being now by export quotas, based on linseed oil content, established for individual firms.

Trinidad Sugar Output.—An official of the Sugar Manufacturers' Association of Trinidad and Tobago estimates that the colony's 1947 sugar output will be approximately 125,000 to 130,000 tons. The Government has fixed an interim price of $6 per ton for farmers' canes during 1947, as compared with $5.50 per ton for 1946.

Australian Metallurgical Plant.—A modern metallurgical plant for the production of tantalum and non-ferrous metals and alloys is to be established at Adelaide, South Australia, by Tantalum Industries Holdings Pty. Ltd., of Sydney, which holds mineral leases in Northern, Western and Southern Australia. A new company with £500,000 capital will develop the industry.

Building Boards in Holland.—A new industry in Holland, established in response to post-war shortage of material and foreign currency, is the manufacture at Hoogezaud, Groningen, of hard and porous straw building boards, of which in 1939 Holland imported 9,241,070 kilos. The total annual production capacity of the new factory is expected to be 54 million sq. ft.

Palestine Coal.—The total coal production of Palestine in 1946 was over 49 million tons, which is slightly in excess of the figure for 1938.

New Zealand Titanium.—The chief geologist of Du Pont de Nemours recently inspected the large ironsand deposits in the Wanganui area of New Zealand, said to contain titanium.

Less Rumanian Petrol.—Petroleum production of Rumania, which in 1945 amounted to 4,260,000 tons, was only 3,860,000 tons in 1946, of which 2,160,000 tons were exported, mainly to Russia.

U.S. Methylamine Output.—The Roehm & Haas Chemical Co., Philadelphia, has more than doubled its capacity for methylamine, which provides the basis for fungicides and insecticides, demand for which is expected to be higher than before the war.

Chilean Nitrate.—Exports of nitrate of soda from Chile in 1946 are returned at 1,435,855 metric tons, compared with 1,621,024 tons in 1945. The decrease was due mainly to labour unrest which is still causing difficulties.

Insoluble Fertiliser.—A water insoluble fertiliser has been patented by the Solvay Process Co. of America. The chief advantage of this new product is that the nitrogen content always remains available to the plant, instead of being washed away by rain or irrigation.

Dutch Resin Plant.—One of Holland's chief industrial ventures, the N.V. Koninklijke Hoogovens en Staalfabrieken, is planning to erect a plant for the manufacture of synthetic resins at Ijmuiden. Furthermore, the company hopes to expand its steelmaking capacity by the use of three blast furnaces instead of the two working at present.

Atomic Materials Controlled.—Uranium and thorium, the basic materials of atomic energy, have been put under the strict control of the U.S. Domestic Atomic Energy Commission. In general, the new control calls for continuation and strengthening of the war-time control of uranium, with thorium also to be included.

Argentine Petroleum.—Argentine import quotas for petroleum and products during the first quarter of 1947 have been established as follows (in metric tons unless otherwise stated): Crude oil, 400,000; fuel oil, diesel oil, and gas oil, 600,000; petrol and solvents, 30,000 cu. m.; kerosene, 10,000 cu. m.; lubricating oils, 2,500; asphalt, 150; lubricating grease, 40; paraffin, 2,200; petrolatum, 300; oil of turpentine, 50,000 litres.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfactions

ALLEN & LLOYD, LTD., Aldershot, chemists and mineral water manufacturers. (M.S., 5/4/47.) Satisfactions February 24, of charges registered September 16, 1920, and May 21, 1929.

BRADLEY & BLISS, LTD., Reading, manufacturing chemists. (M.S., 5/4/47.) February 27, charge to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 4 and 6 London Street, Reading. *Nil. November 6, 1946.

Partnership Dissolved

ANDREW PHILLIPS AND MERRYLEE CHEMICALS, LTD., carrying on business as chemical and dyestuff manufacturers and merchants at Calder Street, Manchester, under the style or firm of "Fine Dyestuffs and Chemicals Company." January 7, 1947.

Company News

A record in the history of the **General Refractories** group was the trading profit of £283,723, made in 1946.

The nominal capital of **Allied Laboratories, Ltd.**, 140 Park Lane, London W.1, has been increased beyond the registered capital of £1000 by £4000 in 2s. ordinary shares.

Final dividend of 22½ per cent (15), making a total dividend for 1946 of 30 per cent (22½), is announced by **Indestructible Paint Co., Ltd.** Profit was £71,370 (£46,896).

The nominal capital of **W. James Davies (Western), Ltd.**, chemical manufacturers, etc., Cardiff, has been increased beyond the registered capital of £2000 by £8000 in £1 ordinary shares.

Profit made by **Manganese Bronze and Brass Co., Ltd.**, for 1946 was £127,977 (£81,407), on which a final dividend of 22½ per cent (17½), making 30 per cent (25) for the year, is to be paid.

Treasury consent has now been received by **Timothy Whites and Taylors, Ltd.**, to an issue at par of £1,000,000 3½ per cent First Mortgage debenture stock in conversion or replacement of the existing £1,000,000 4 per cent debenture stock.

On the trading year to September 30, 1946, **African Explosives and Chemical Industries, Ltd.**, made a profit of £1,107,670 (£1,054,238) yielding a net figure of £938,085 (£883,156).

A trading profit for 1946 of £57,275 (£20,757) is announced by **Paripan, Ltd.**, a final dividend of 30 per cent, making a total of 40 per cent (25 per cent).

In addition to maintaining final dividend on the £132,060 Ordinary at 10 per cent, **William Blythe and Co., Ltd.**, is doubling the bonus at 10 per cent, making, with the increased interim dividend, a total of 30 per cent for 1946 of 30 per cent (20).

General Chemical Corporation (registered in South Africa) offers 200,000 5s. Ordinary shares to shareholders registered in the books at close of business on April 12 at 15s. per share in the proportion of one for every two shares held.

New Companies Registered

United Plastics and Chemicals (London), Ltd. (431,569).—Private company. Capital £100 in £1 shares. Subscribers: B. Seymour, B. Greenby. Solicitors: Mackrell Maton & Co., 31 Bedford Street, London, W.C.2.

Stuart-Leroy, Ltd. (431,035).—Private company. Capital £10,000 in £1 shares. Manufacturers of chemicals, gases, etc. Directors: Florence Stuart and Evelyn Leroy. Registered office: 6a Maddox Street, London, W.1.

P. C. Products, Ltd. (431,883).—Private company. Capital £3000 in £1 shares. Manufacturers of chemicals and chemical products, etc. Directors: J. Benjamin, M. Stiller. Registered office: 29 Mayfair Avenue, Whitton.

Windle Products, Ltd. (431,990).—Private company. Capital £1000 in £1 shares. Manufacturers of plastics, paints, dyes, chemicals. Directors: W. Aukland, G. Carruthers, E. Hill. Solicitors: Trevor J. Rees, 28 Rutland Street, Swansea.

Golden Valley Chemical Works, Ltd. (431,854).—Private company. Capital £4000 in £1 shares. To acquire business carried on at Stroud as the "Golden Valley Chemical Co." Directors: H. Covell, E. Peddle. Registered office: 20 Gloucester Street, Stroud.

Pictorial Machinery (Chemicals) Ltd. (430,095).—Private company. Capital £4000 in 4000 shares of £1 each. Manufacturers, etc., of industrial and general chemicals, etc. Directors: F. and J. Corkett, H. Warman. Registered office: 99, Chase Side, London, N.14.

L. Charerat & Co., Ltd. (430,800).—Private company. Capital £8000 in £1 shares. To acquire the business carried on at 15-16 Cullum Street, London, E.C., by Louis Charerat as "L. Charerat & Co.," dealers in and exporters and importers of phosphates, fertilisers, chemicals, mineral ores, heavy chemicals, and bye-products, etc. Directors:

L. Charerat, F. Thorne, E. Tyberghein. Registered office: 15 & 16 Cullum Street, London, E.C.3.

Glostics, Ltd. (430,789).—Private company. Capital £5000 in £1 shares. Importers, developers, producers and sellers of plastic bases and compounds of all types, including protective coating, moulding powders, casting materials, synthetic rubber, paints, resins, etc. Directors: G. Seymour, R. Carter. Registered office: Abbey Yard, Bath.

Albion Compounds Ltd. (431,216).—Private company. Capital £100 in £1 shares. Manufacturers of chemicals, fillers and compounds for the rubber, paint, chemical and allied industries, etc. Directors: H. Brown, A. Campbell, H. D. Brown, E. Coombs. Solicitors: Boardman, Barritt & Co., Manchester.

Lion Plastics, Ltd. (429,788).—Private company. Capital £1000 in 1000 ordinary shares of £1 each. Manufacturers of natural and synthetic plastics and plastic substances, chemical and other substances, etc. Subscribers: M. Blankfine, V. Maidment. Registered office: 52-4 High Holborn, London, W.C.1.

Patentees Facilities Corporation Ltd. (429,710).—Private company. Capital £5000 in £1 shares. To promote and finance development and exploitation of patents in England and elsewhere, and to carry on business of manufacturers of patent fuel and coke, carbonisers and distillers of coal and other substances, manufacturers of gas and similar products, etc. Directors: B. Myers, E. Forge. Solicitors: Edward Montague, Lazarus and Son, 10 Queen Street, London, W.

Chemical and Allied Stocks and Shares

HELPED by the promise that the Budget will contain a statement in defence of the Government's "cheaper money policy," British Funds have continued their rally with a beneficial influence on markets generally. Business remained on moderate lines, but selling was checked by the view that for the time being at any rate industrial shares are unlikely to show any marked reaction unless British Funds were to move back sharply. On the other hand, it seems that buying interest in markets is unlikely to increase between now and the Budget statement on Tuesday. Moreover, demand will probably be a good deal more selective than was the case at the beginning of the year. The fuel and steel shortages are affecting the earnings of a wide range of companies, and this has so far not been reflected in share values. There appears to be a growing tendency to favour shares of leading industrial companies with widespread overseas and export trade interests.

Imperial Chemical, after easing to 46s. 10½d., have recorded a renewed rise to 47s. 7½d. on further consideration of the preliminary figures for the past year's working. The view appears to have gained ground that the annual distribution would not have been raised from 8 per cent to 10 per cent unless there were reasonable prospects of its being maintained. On the preliminary figures, it would appear that approximately 22½ per cent was earned on the ordinary stock units last year and the yield at the current price exceeds 4⅛ per cent. United Molasses at 57s. 3d., Dunlop Rubber at 69s. 9d., and British Match at 53s. moved up, accompanied by talk of higher dividend possibilities. General Refractories strengthened to 22s. 3d. xd on the full results. Turner & Newall have firmed up to 85s. 9d.; British Oxygen were good at 98s. 9d., and Associated Cement better at 64s. 4½d., with British Plaster Board 31s. 9d. Shares of companies connected with plastics have been more prominent, with Distillers 136s. 6d., while British Xylonite changed hands up to £8. De La Rue were 60s.; British Industrial Plastics 9s., and British Glues 4s. ordinary remained firm at 17s. In other directions, the higher base metal prices had no influence on Amalgamated Metal at 19s.; and Imperial Smelting were 20s. 4½d. Still reflecting the higher price of the metal, British Aluminium have been firm at 47s. 3d. Elsewhere, Borax Consolidated deferred were wanted up to 59s., and shares of other companies with important U.S. interests were also favoured. On the other hand, Triplex Glass eased to 35s. Goodlass Wall were 32s. 6d., and shares of other paint manufacturers have been firm, helped by the dividend increase announced by Indestructible Paint. Shares of the latter were at £7.

Colvilles showed activity and at 26s. 9d. were higher on balance, though best levels were not held, the unchanged 8 per cent dividend coming as a disappointment to the market in view of the big profit increase. Dorman Long, United Steel, Guest Keen and other iron and steel shares were in better request, attention being drawn to the good yield and to the prevailing view that the industry has been reprieved from nationalisation for at least two years. Boots Drug eased to 60s. 9d., but Timothy Whites have firmed up to 48s., and Sangers to 35s., the latter being favoured because the company appears to be among those which will benefit substantially from the abolition of E.P.T. William Blythe 3s. shares moved up to 17s. 3d. on the results and increased distribution. Elsewhere, Blythe Colour Works 4s. ordinary changed hands up to 53s. 6d. Oil shares turned easier.

Prices of British Chemical Products

THE shorter working week has not had the same influence on the market as it would have had if there had been normal activity in recent weeks. Reports from most sections indicate that there is some, although only slight, improvement in the general supply position. The flow of inquiries from overseas continues to be of fairly substantial dimensions, but actual bookings are relatively small. Prices throughout are unchanged, with the undertone very firm. There are no outstanding features to report in the coal-tar products section.

MANCHESTER.—Trade in both light and heavy chemical products on the Manchester market during the past week has been distinctly under holiday influences and deliveries under contracts as well as new business have been affected. Consuming establishments resumed after the stoppage at the full pre-holiday scale of operations, though this, however, represents a reduced rate compared with normal, especially in the textile, glass and certain other important chemical-using industries in Lancashire. Both home consumers and shippers are in the market for a wide range of additional materials and outputs of most classes are being fully absorbed. There is a steady call for sulphate of ammonia and other fertilisers and in the tar products market a generally brisk demand is reported.

GLASGOW.—There has been no noteworthy change in the Scottish heavy chemical trade during the past week. The supply position is still very difficult. In the export market inquiries are on an increasing scale, particularly for Glauber salts, copper sulphate, bleaching powder, waxes, and dyestuffs. The shortage of shipping space, particularly for dangerous cargoes, is adversely affecting the export trade. In general prices are still increasing.

Price Changes

Rises: Creosote, copper sulphate, lactic acid, lead nitrate, red lead, white lead, naphthalene, potassium bichromate, sodium bichromate.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £56 10s.; 80% pure, 1 ton, £58 10s.; commercial glacial 1 ton £70; delivered buyers' premises in returnable barrels: £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 1/5 tons, £86 10s.; single drums, £87 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton, f.o.r. MANCHESTER: £16 to £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 8d. per lb.

Ammonium Bicarbonate.—MANCHESTER: £40 per ton d/d.

Ammonium Carbonate.—£42 per ton d/d in 5 cwt. casks. MANCHESTER: Powder, £43 d/d.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Antimony Oxide.—£135 to £138 per ton.

Arsenic.—Per ton, 99/100%, £38 6s. 3d. to £41 6s. 3d., according to quality, ex-store.

Barium Carbonate.—Precip., 4-ton lots, £20 per ton d/d; 2-ton lots, £20 5s. per ton. bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 4-ton lots, £19 10s. per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £20 per ton d/d; 2-ton lots, £20 5s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; pow-

dered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£23 per ton, d/d in 16/17 cwt. drums (3-drum lots).

Chrometan.—Crystals, 5½d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6½d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Copper Carbonate.—MANCHESTER: 1s. 4d. per lb.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Sulphate.—£44 7s. 6d. per ton f.o.b., less 2%, in 2 cwt. bags.

Cream of Tartar.—100 per cent., per cwt., from £12 14s. 6d. for 10-cwt. lots to £14 1s. per cwt. lots, d/d. Less than 1 cwt., 2s. 5½d. to 2s. 7½d. per lb. d/d.

Formaldehyde.—£27 to £28 10s. per ton in casks, according to quantity, d/d. MANCHESTER: £28.

Formic Acid.—85%, £54 per ton for ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1260 s.g., £6 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—11d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Lactic Acid.—Pale tech., £70 per ton; dark tech., £60 per ton ex works; barrels returnable.

Lead Acetate.—White, 95s. to 100s. per cwt., according to quantity.

Lead Nitrate.—About £95 per ton d/d in casks. MANCHESTER: £95.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £106; orange lead, £118. Ground in oil; Red, £132; orange £144. Ready-mixed lead paint: Red, £140; orange, £152.

Lead, White.—Dry English, in 8-cwt. casks, £116 10s. per ton Ground in oil, English, in 5-cwt. casks, £141 per ton.

Litharge.—£83 10s. to £86 per ton, according to quantity.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £36 per ton.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt lots, 7s. 6d.; smaller quantities dearer.

Mercurous Chloride.—9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 4d. per gal.; pyridinised 64° O.P. 100 gals., 4s. 5d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£100 to £105 per ton in ton lots packed in free 5-cwt. casks. MANCHESTER: £5 to £5 5s. per cwt.

Paraffin Wax.—Nominal.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £57 10s. per ton for 5-ton lots, £57 10s. per ton for 1 to 5-ton lots, all ex store; hydrated, £51 10s. per ton for 5-ton lots, £51 10s. for 1 to 5-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 2s. 1d. to 3s. 0d. per lb. d/d.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£42 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £19 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£45 to £47 per ton.

Sodium Hyposulphite.—Pea crystals 22s. 6d per cwt. (2 ton lots); commercial, 1-ton lots, £17 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., for not less than 28 lb., 10s. 2d. per lb.

Sodium Metaphosphate (Calgon).—11d. per lb. d/d.

Sodium Metasilicate.—£16 15s. per ton, d/d U.K. in ton lots.

Sodium Nitrite.—£23 per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt.

Sodium Phosphate.—Di-sodium, £27 10s. per ton d/d for ton lots. Tri-sodium, £30 per ton d/d for ton lots (crystalline).

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber Salt).—£5 5s. per ton d/d.

Sodium Sulphate (Salt Cake).—Ungrounded. Spot £4 11s. per ton d/d station in bulk. MANCHESTER: £4 12s. 6d. to £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot, £20 12s. 6d. per ton, d/d, in drums; crystals, 30/32%, £13 12s. 6d. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 5s. to £16 10s., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. 8d. to £7 2s. 8d. per ton; 140° Tw., arsenic-free, £4 15s. per ton;; 140° Tw., arsenious, £4 7s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt., for 10 cwt. or more, £15 8s.; 5 to 10 cwt., £15 9s. 6d.; 2 to 5 cwt., £15 11s.; 1 to 2 cwt., £15 13s. Less than 1 cwt., 3s. 1d. to 3s. 3d. per lb. d/d, according to quantity.

Tin Oxide.—1 cwt. lots d/d £25 10s.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £68 15s.; green seal, £70 5s.; red seal, £71 5s.

Zinc Sulphate.—No quotation.

Rubber Chemicals

Antimony Sulphide.—Golden, 3s. to 4s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£48 to £51 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d to 1s. 5½d. per lb.; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £28 2s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Imported material, 11% nitrogen, 48% phosphoric acid, per ton in 6-ton lots, d/d farmer's nearest station, in December £20 4s. 6d., rising by 2s. 6d. per ton per month to March, 1947.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in December £9 18s. 6d., rising by 1s. 6d., per ton per month to March, 1947.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 9½d. to 11½d. per lb., d/d; crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6½d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER, 6½d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 75s. to 80s. per ton f.o.r. suppliers' works; export trade, £6 15s. per ton f.o.b. suppliers' port. MANCHESTER: 77s. 6d. f.o.r.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. MANCHESTER: 14s. 6d. to 18s. 6d. per gal.

Toluol.—Pure, 3s. 2½d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2¼d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—April 8. For the period ending May 3 (May 24, 1947, for refined oils), per ton, naked, ex mill, works or refinery, and subject to additional charges according to package; LINSEED OIL, crude, £200. RAPESEED OIL, crude, £190. COTTONSEED OIL, crude, £109; washed, £112. COCONUT OIL, crude, £106; refined deodorised, £112; refined hardened deodorised, £116. PALM KERNEL OIL, crude, £105 10s., refined deodorised, £112; refined hardened deodorised, £116. PALM OIL (per ton c.i.f.), in returnable casks, £99 5s.; in drums on loan, £98 15s., in bulk, £97 15s. GROUNDNUT OIL, crude, £110 10s.; refined deodorised, £114, refined hardened deodorised, £118. WHALE OIL, refined hardened, 42 deg., £117; refined hardened, 46/48 deg., £117. ACID OILS, Groundnut, £94; soya, £92; coconut and palm-kernel, £97 10s. ROSIN: Wood, 32s. to 45s.; gum, 44s. to 54s. per cwt., ex store, according to grade. TURPENTINE, American, 87s. per cwt. in drums or barrels, as imported (controlled price).

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each. Numbers given under "Applications for Patents" are for reference in all correspondence up to acceptance of the complete specification.

Complete Specifications Open to Public Inspection

Cylindrical objects manufactured by an extrusion process.—N.V. Philips Gloeilampenfabrieken. Feb. 16, 1944. 2894/47.

Converting polymerisable liquid compounds into solid or semi-solid polymerisation products.—N.V. Philips Gloeilampenfabrieken. Feb. 25, 1944. 3203/47.

Copper phthalocyanine dyestuffs.—G. M. O'Neal. Sept. 15, 1943. 2669/47.

Strontium peroxide.—A. Pavlik. Nov. 28, 1944. 2618/47.

β-Alanine.—Roche Products., Ltd. Sept. 5, 1945. 22406/46.

N - nitroaryl haloarylsulphonamides.—Röhm & Haas Co. June 24, 1943. 8806/44.

Polymeric detergents.—Röhm & Haas Co. Sept. 9, 1944. 3862/45.

Materials containing polyvinyl derivatives.—Soc. Rhodiaceta. May 3, 1945. 3219/47.

Liquid catalyst of the friedel-crafts type and process for applying same to the alkylation of cyclic hydrocarbons.—Universal Oil Products Co. April 29, 1944. 12471/45.

Purifying grycerine containing ionisable impurities.—American Cyanamid Co. Sept. 15, 1945. 22042/46.

Resinous materials.—American Cyanamid Co. Sept. 15, 1945. 25416-7/46.

1-Substituted-3- cyanoguanidines and 1, 5 substituted-biguanides.—American Cyanamid Co. Sept. 11, 1945. 27015-21/46.

Recovery of polymers from aqueous dispersions thereof.—British Celanese, Ltd. Sept. 12, 1945. 27175/46.

Organic compounds and their use.—British Celanese, Ltd. Sept. 13, 1945. 27430/46.

Pharmaceutical preparations.—E. A. Brown, and H. A. Abrahamson. Sept. 11, 1945. 28139/46.

Sodium chromate or sodium bichromate.—Chrome Chemicals (Australia) Proprietary, Ltd. Sept. 15, 1945. 22723/46.

Carboxylic-acid derivative.—Cilag, Ltd. Sept. 15, 1945. 26001/46.

Derivatives of pyridine-3-carboxylic acid.—Cilag, Ltd. Sept. 15, 1945. 26003/46.

Aniline condensation products.—B. F. Goodrich. Sept. 10, 1945. 24619/46.

Magnesium base alloys.—Mathieson Alkali Works. Sept. 14, 1945. 17805/46.

Magnesium base alloys.—Mathieson Alkali Works. Sept. 14, 1945. 17806/46.

Alloys.—Mathieson Alkali Works. Sept. 14, 1945. 17807/46.

Determining initial boiling point of liquids.—W. M. Mercer. Sept. 17, 1945. 18612/46.

Valuable products from sodium sulphate.—S. J. Mornard. Sept. 15, 1945. 27757/46.

Synthesis of hydrocarbons.—Phillips Petroleum Co. Sept. 10, 1945. 25782/46.

Obtaining additional chlorinated compounds.—Progil. Sept. 10, 1945. 15848/46.

Wet-strength paper.—Resinous Products & Chemical Co. Sept. 15, 1945. 18605/46.

Polymers.—Ridbo Laboratories Inc. Sept. 15, 1945. 25420/46.

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APPLICATIONS are invited from Chemical Engineers for refinery duties with large oil company in Middle East. Candidates must possess good degrees in Chemistry or Engineering and, desirably, Membership of the Institute of Chemical Engineers, together with considerable responsible industrial experience. Salary (progressive) from £1,000 per annum; quarters and allowances within the range of £300-£500 yearly dependent on family circumstances; Provident and (non-contributory) Pension Funds. Age limit, 34—otherwise non-pensionable. Married candidates must be prepared to accept initial two years' separation. Write, quoting K.5(14) to Box No. 1629, c/o CHARLES BARKER & SONS LTD., 31, Budge Row, London, E.C.4.

CHEMICAL Engineer wanted, familiar with large scale wet processes for the production of oxides of chromium and other metals for works in midlands. Attractive progressive position for capable man. Please write full details to Box No. 2439, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

CHEMISTS OR ENGINEERS required for supervision of chemical processes. Some shift work necessary in the early stages. Initial salary in the order of £450 per annum. Reply, giving full details of age, qualifications and experience, to Box No. 2443, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

YORKSHIRE Chemical Manufacturers require Organic Research and Development Chemist, age 22–30, with University Degree, preferably in Colour Chemistry. Candidates having A.R.I.C. or equivalent qualifications will be considered. Salary according to age and experience. Superannuation scheme in operation. Box No. 2445, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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PLANT Chemists urgently required for Process Plant Operation by large company operating in the Middle East. Applicants need not be Graduates but should have had a chemical training up to Inter. B.Sc. or National Certificate Standard with experience of shift work in either a gas, coke oven or chemical works. Age not over 30. Salary in sterling between £540 and £600 per annum, plus generous allowances in local currency, with free furnished bachelor accommodation, passages out and home, medical attention, also kit allowance and Provident Fund benefits. Apply, stating age, qualifications and experience, etc., to Dept. F.22, Box No. 2435, THE CHEMICAL AGE, 154, Fleet Street London, E.C.4.

YOUNG man, Inter. B.Sc., standard, aged 20-24, required for interesting work in radium laboratory. Applicants, who should have completed military service, should apply in writing, giving full particulars of age, qualifications, experience and salary, to Assistant Secretary, JOHNSON, MATTHEY & CO., LTD., 78, Hatton Garden, London, E.C.1.

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NEW 100-gallon Stainless Steel Storage Tanks, mounted on welded skirt band, fitted with two carrying handles, 2 ft. 10¾ in. dia. by 2 ft. 11 in. deep.

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